SEP 8 1910

LIBRARY OF CONGRESS SEP 10 1910 COPYRIGHT ENTRY

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3 1879

VOL. XXV NO. 10 | SAN FRANCISCO, SEPTEMBER 3, 1910 | PER COPY, 10 CENTS

Henshaw, Bulkley & Co.

ENGINEERS

Machinery Merchants

San Francisco: 19 - 21 Fremont Street
Los Angeles: 262 So. Los Angeles St.
Oakland: 1436 Fifth St.

OKONITE WIRE

OKONITE TRADE MARK REG. U.S PATENT OFFICE

The STANDARD for RUBBER INSULATION

Okonite Tape, Manson Tape, Candee Weatherproof Wire, Candee (Patented) Potheads.

The Okonite Company

253 BROADWAY, NEW YORK

CENTRAL ELECTRIC CO., Chicago, Ill. F. D. LAWRENCE ELECTRIC CO., Cincinnati, O.
NOVELTY ELECTRIC CO., Philadelphia, Pa. PETTINGELL-ANDREWS CO., Boston, Mass.
ROBBINS ELECTRIC CO., Pittsburg, Pa.

PARANITE

INDIANA RUBBER AND INSULATED WIRE CO.

Manufacturers of Paranite and Peerless Rubber Covered Wires and Cables
Underground Aerial, Submarine and Inside Use
Telephone, Telegraph and Fire Alarm Cables
All Wires are Tested at Factory JONESBORO, IND.

Electric Appliance Company

728 Mission St., San Francisco — Pacific Coast Agents

Standard Underground Cable Co.

MANUFACTURERS OF

COPPER WIRES, CABLES AND ACCESSORIES

FOR ALL SERVICES

PACIFIC COAST DEPT. First National Bank Building, San Francisco
Sub-Office—Los Angeles, Cal.
GENERAL OFFICES: PITTSBURG, PA.
Factories Oakland, Cal., Pittsburg, Pa., Perth Amboy, N. J.
Branch Offices: New York, Boston, Chicago, Philadelphia, St. Louis

Phillips Insulated Wire Co.

PAWTUCKET, R. I.

"O.K." WEATHERPROOF
"PARAC" RUBBER COVERED

COMPLETE STOCKS CARRIED BY
OUR PACIFIC COAST AGENTS

California Electric Co. LOS ANGELES — Electric Appliance Co. SAN FRANCISCO — Western Electric Co. SEATTLE

Specify....

BROOKFIELD GLASS INSULATORS

The Standard

PACIFIC METER CO.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

311 SANTA MARINA BUILDING
California and Drumm Sts. — San Francisco

VULCAN ..... Refrigerating and Ice Making Machinery

MANUFACTURED BY

VULCAN IRON WORKS

Office: 702 Atlas Bldg., 604 Mission St.
Works: Francisco and Kearny Streets — San Francisco

FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT

Century Motors

(SINGLE PHASE)

CAN BE STARTED BY ANY DEVICE which will serve to close the circuit

This feature makes them especially adapted to control from float switches in pumping installations, pressure switches in compressed air installations, thermostats in refrigerating installatons, push button control in vacuum cleaner installations, etc.

We build them in sizes of ¼ to 40 hp. in horizontal, vertical and back geared types for any frequency between 25 and 140 cycles, all of which will render constant uninterupted superior service.

CENTURY ELECTRIC CO.

OF ST. LOUIS, MO.

R. J. DAVIS, Pacific Coast Representative

633 HOWARD STREET, SAN FRANCISCO

For Telephone and Bell Wiring

BLAKE INSULATED STAPLES

are just the thing. Drive straight without bending because of square shoulder Fibre under head affords perfect protection to insulation. Effective on corners as well as straight runs.

A better job secured with less staples, in less time and at less cost than by any other method.

All sizes for single, double, triple and multi-conductor wires.

Write for samples.

BLAKE TUBE FLUX

An insulating, non-corrosive soldering flux in the most convenient form.

PACIFIC COAST AGENTS:

BROOKS-FOLLIS ELECTRIC CORP.
SAN FRANCISCO

WESTERN ELECTRIC CO.
SAN FRANCISCO

BLAKE SIGNAL & MFG. CO., BOSTON
Manufacturers

POLE LINE MATERIAL

THE MOST COMPLETE STOCK ON THE PACIFIC COAST

COMPRISING

Poles and Cross Arms, Everstick Anchors, Glass Insulators, Cross Arm Braces, Strand, Guy Clamps (2 and 3 Bolt), Steps, Lag, Machine and Double Arm Bolts, Locust and W. U. Pins, Thomas High Tension Insulators, Glass and Porcelain Strain Insulators, Guy Rods

Together with a full line of Construction Tools which enables us to fill Line Material orders the same day as received.

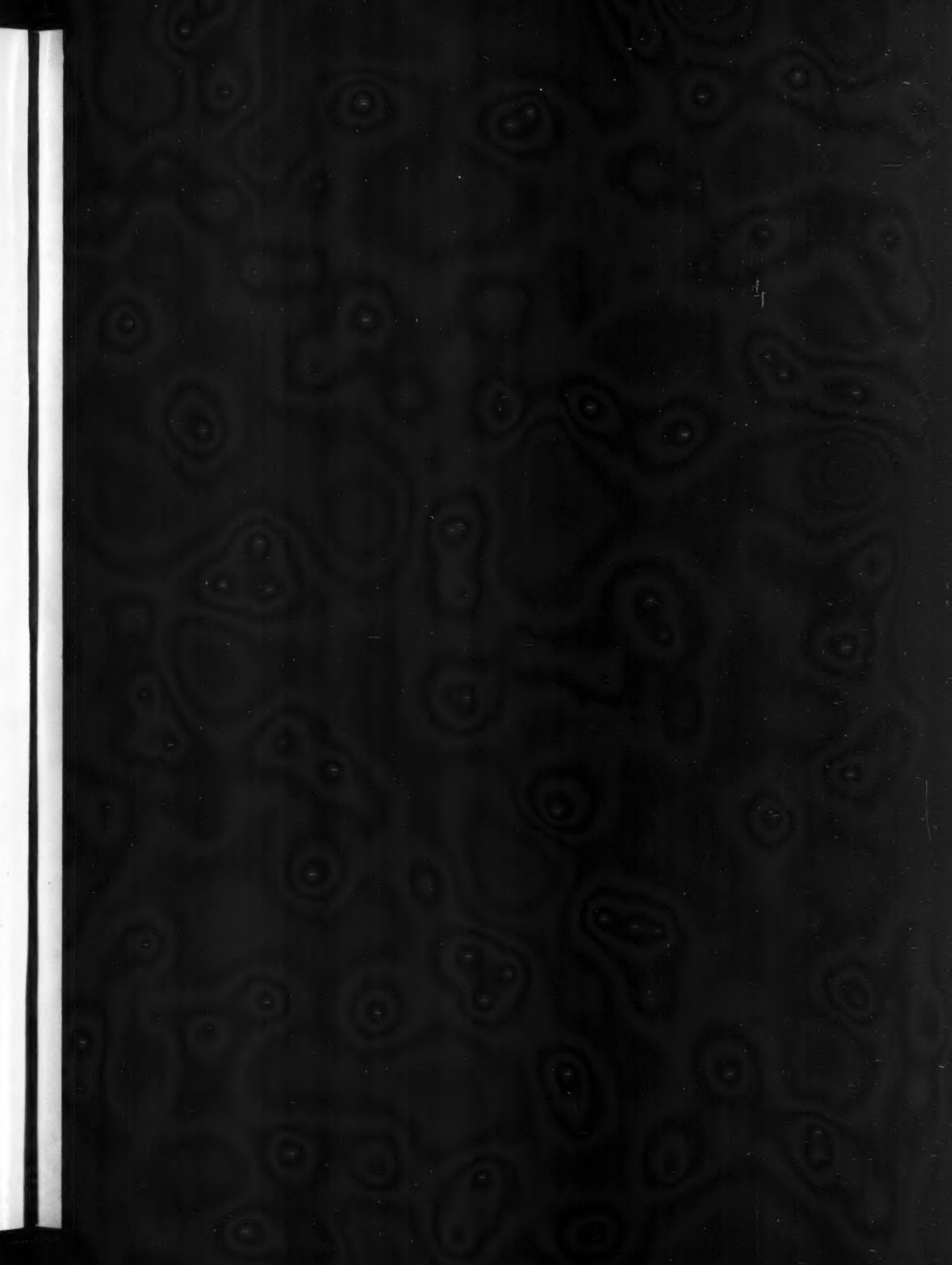
All Galvanized Material Guaranteed High Grade, Hot Dip Process

Pacific States Electric Company

The Modern Electrical Supply House

ADDRESS OUR NEAREST HOUSE

SAN FRANCISCO
LOS ANGELES
OAKLAND
PORTLAND, ORE.



B 2,13522

JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXV SAN FRANCISCO, SEPTEMBER 3, 1910. NUMBER 10

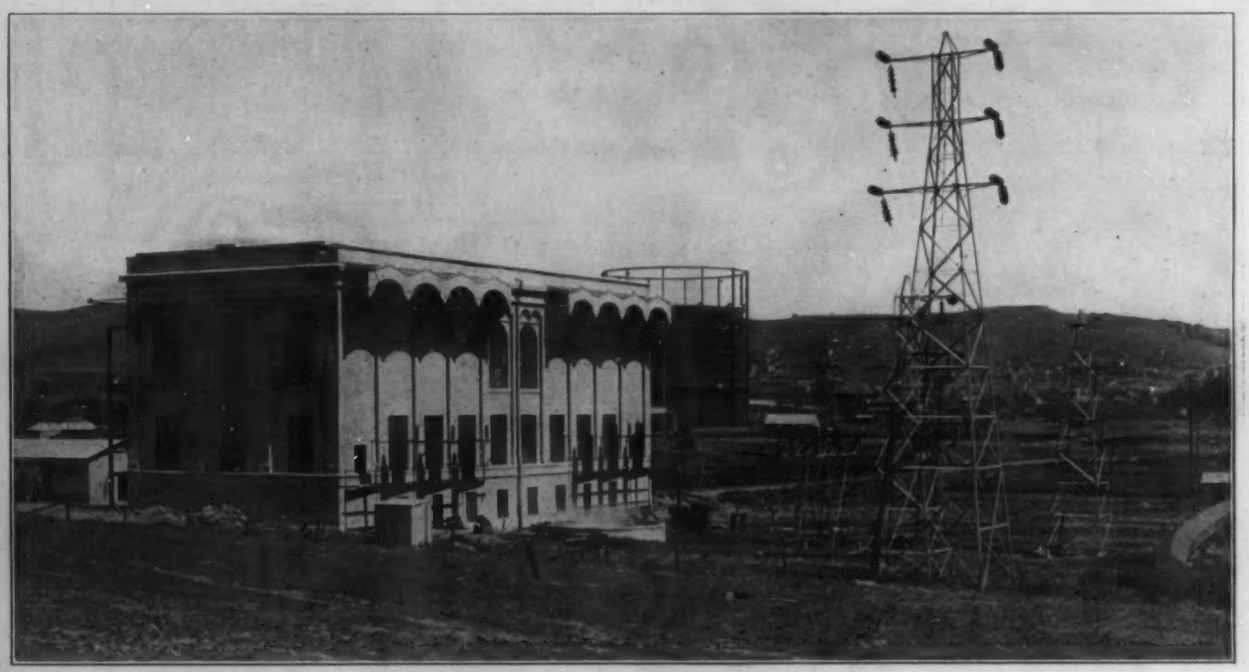
[Copyright 1910, by Technical Publishing Company]

THE BAY SHORE SUBSTATION

Few San Franciscans who complain of the occasional delay in the street-car service ever stop to think that most of the power by which these cars are run is generated in the Sierra Nevada Mountains nearly 150 miles from the city of San Francisco. Only an engineer familiar with the many difficulties involved in transmitting a large amount of power such a great distance can appreciate the constant care that is necessary to avoid even a brief interruption to service.

Although it is cheaper to generate electric power by means of water, continuity of service demands that there be one or more reserve steam stations in case of emergency or at times of heavy load. So, as a matter of economy, the United Railroads of San Francisco place their main reliance for power upon the hydraulic plants in the Sierra Nevada Mountains, but have in reserve a sufficient steam power plant capacity to be thrown on as occasion demands. As described in this journal, August 21 and September 4, 1909, 20,000 kilowatts hydraulically generated on the Stanislaus river are transmitted at 100,000 volts by means of a double circuit steel tower line 135 miles long. This line terminates at the Bay Shore substation of the Sierra and San Francisco Power Company, which is illustrated herewith, and which it is the purpose of the present article to briefly describe.

This substation is situated in Visitacion Valley, south of San Francisco, and close to Martin Station of the Pacific Gas & Electric Company. Briefly stated, its function is to reduce the incoming high voltage of 100,000 to an out-going lower voltage of 12,000 for distribution to the various converting stations throughout the city and county of San Francisco. As is well known, a high voltage, while economical in transmitting power long distances, is dangerous to introduce into cities and must consequently be reduced for distribution.



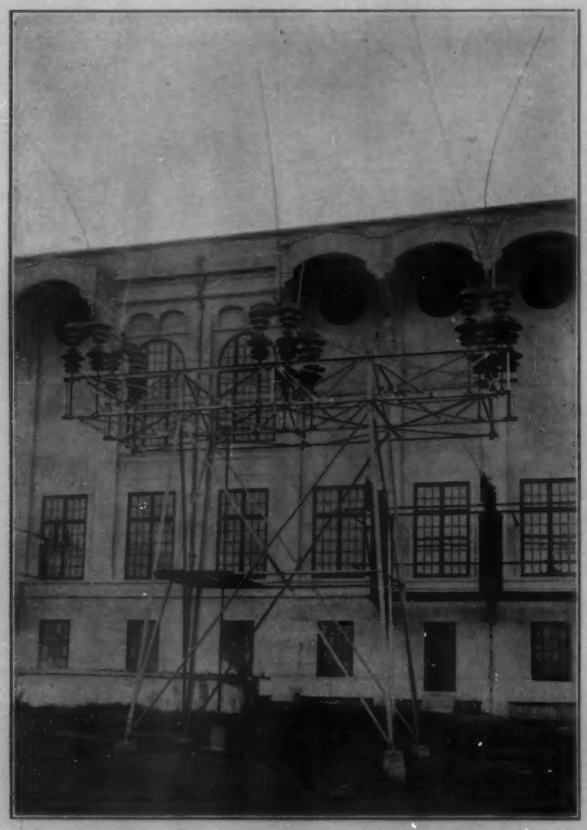
Bay Shore Substation of San Francisco & Sierra Power Co.

This is done by means of six great transformers, each having a capacity of 3750 kw. These immense transformers are the latest, though probably not the

last word in the design of apparatus to meet increasing demands for greater capacity and higher voltage. They were intended for a high tension voltage of 138,500, but before installation an insulation test of 280,000 volts was applied for one minute. The other noteworthy features of the installation are the methods of automatic switching, oil filtering and purifying system, and the means of circulating and cooling the water.

Exterior Equipment.

All of this apparatus is substantially housed in a class A re-inforced concrete structure 124 by 60 ft. in area and 60 ft. high. Provision has been made for



Bowie Disconnecting Switch

future increase in capacity by merely building additions at either end, where the walls have been temporarily constructed of wire-lath and plaster and the steel frame adapted for easy extension. A small wing on the west side of the building contains the switchboard gallery and the storage battery equipment.

The sub-station faces the east and as the transmission lines come in from the south it has been necessary to change their direction through an angle of ninety degrees by means of two turning towers as illustrated on the first page. The lines are dead ended upon these towers with Locke five-element suspension-type strain insulators.

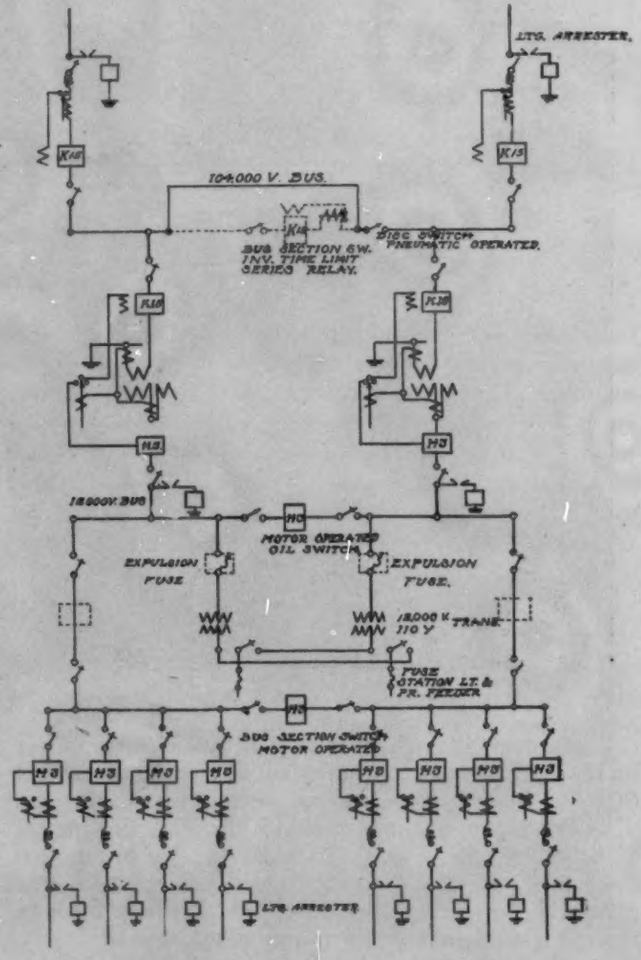
A long transmission line of this character is likely to be subjected to the effects of lightning or high frequency surges resulting from short circuits or sudden load variations, it is consequently necessary that the valuable apparatus in the sub-station, as well as the lives of the operators, be protected by every means possible. Though lightning seldom occurs on this coast, a most elaborate system of protection has nevertheless been installed, the main reliance being placed upon aluminum cell lightning arresters and upon a system of well designed grounds.

Furthermore one of the incoming circuits passes from the turning tower directly through a Bowie 104 kilovolt open break disconnecting switch just outside the building. This is manually operated and will break any arc by means of the diverging horns.

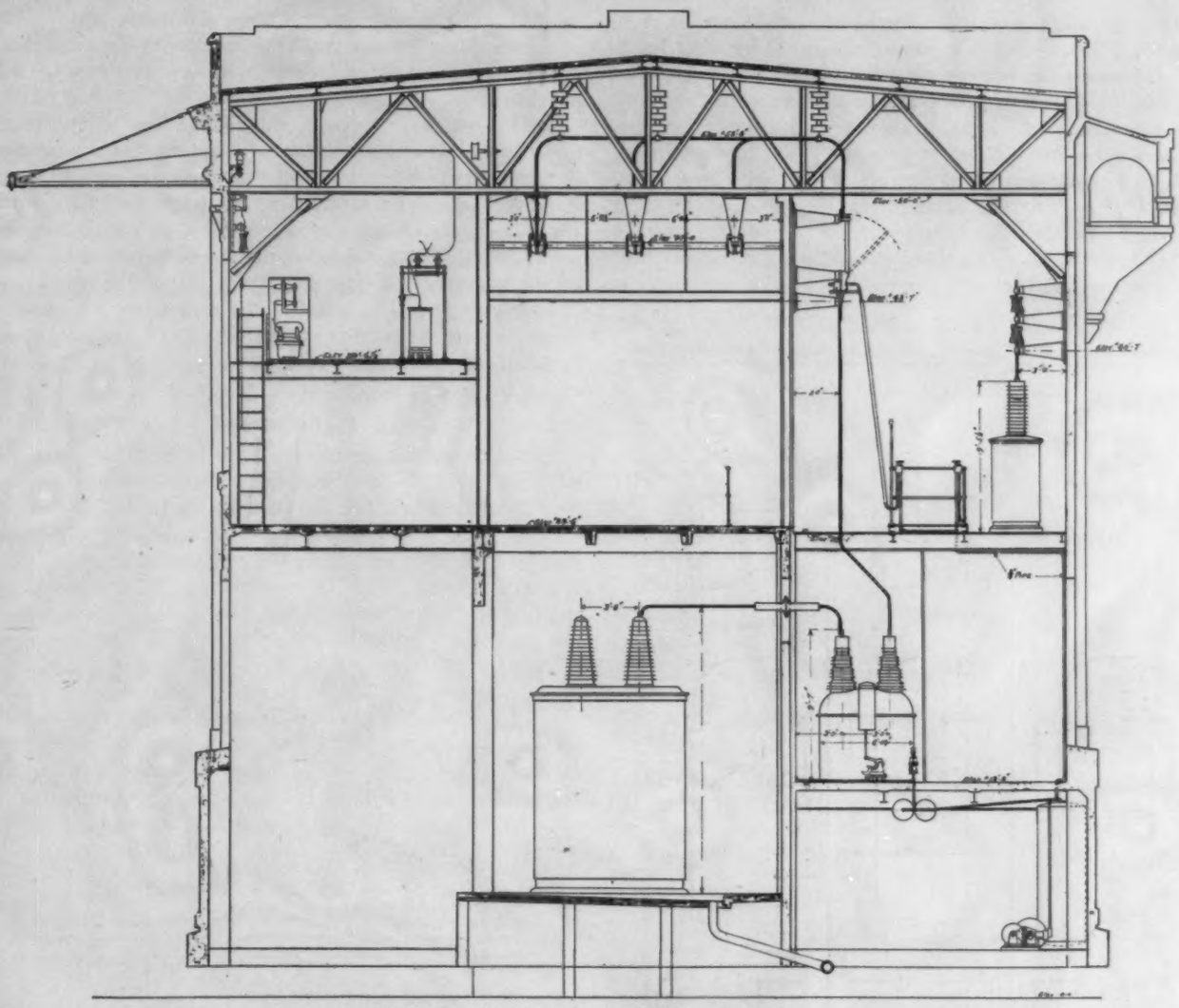
After taps have been taken off to the lightning arresters below, the two circuits are lead into the building through large open porticos giving a circular opening 6 ft. in diameter and overhung for protection against the rain. The circuits are dead-ended to the steel frame work by disc insulators.

Interior High Tension Wiring.

The system is at present run at 60 cycles, 3-phase, 104,000 volts, grounded "Y" on the high tension side, although all the high tension apparatus, except the lightning arresters, is specified as 114,000 volt. To fully understand the ensuing course of the circuits it is necessary to supplement the descriptive text with the accompanying wiring diagrams.



Plan of Substation Wiring



Typical Section of High Tension Switching Arrangement.

Inside the building and just below the entrance porticos are six pneumatically operated disconnecting switches. These are furnished with air at 80-lb pressure from two storage tanks supplied by two motor driven compressors and are controlled by two-way motorman's valves attached to the railing of the steel deck below. The same compressor outfit also supplies air for all other pneumatic switches in the building, and also for cleaning purposes.

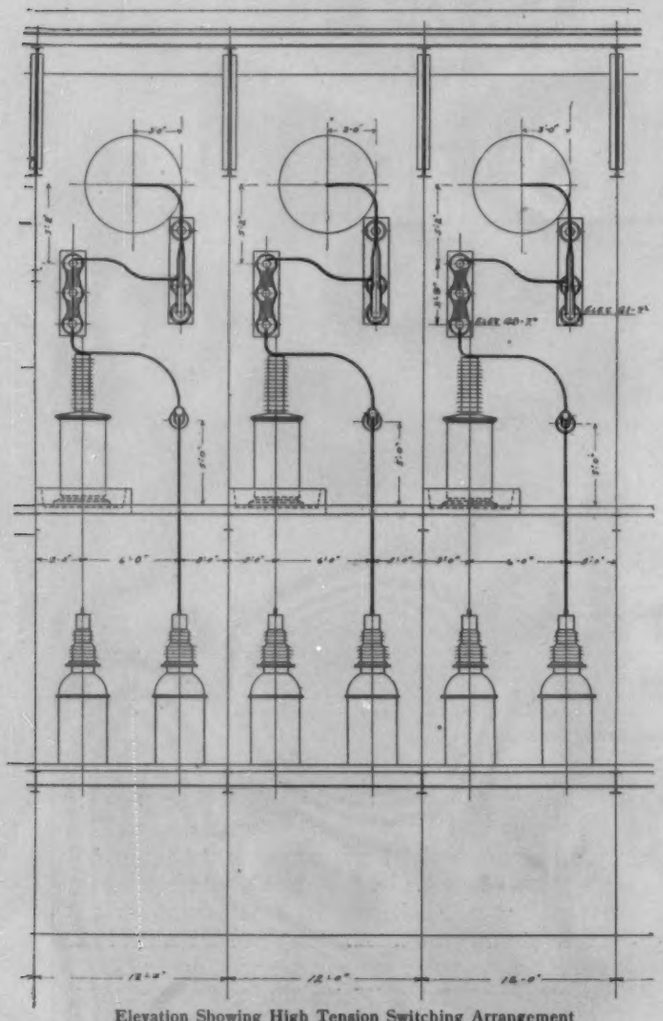
From the disconnecting switches the circuits pass through double choke-coils mounted on post type insulators, then through the current transformers, thence through and finally to the main bus to which the main transformers are connected through the K 15 oil switches and the disconnecting switches.

From the 110-volt secondaries of the current transformers wires are lead directly to the switchboard totalizing and indicating wattmeters and ammeters. In the main circuit there are also inserted 200 ampere type R 2 primary ammeters which are used primarily to determine whether the lines are alive.

The automatic circuit breakers are a special adaptation of the usual type K oil switch designated as type K 15 and designed for large capacities. As shown by the accompanying view they consist essentially of a sheet-iron tank with dome shaped top of cast-iron and filled with oil. The two lines are brought through the

K-15 Oil Switches.

cover in large insulator bushings made up of segments of insulating compound separated by fiber bushings. The switch itself is a horizontal bar suspended at the lower end of a wooden arm operated by the outside mechanism so as to make and break the contact with spring clips suspended from the bushings. As this make-and-break occurs under oil there is little danger of severe arcing. In fact 16,000 kilowatts at 104,000 volts have been interrupted with no trouble. This circuit-breaker is pneumatically operated through an electro-magnetically controlled air valve which in



Elevation Showing High Tension Switching Arrangement

turn controls the three diaphragms connected in parallel which operates the three switches. Three series trip-coils are mounted on insulators as shown in the illustration. The circuit breaker is second in importance only to the transformers and its proper design in controlling circuits of such magnitude marks the removal of one of the most serious limitations to high voltage transmission.

The main high-tension bus is of open construction, dead-ended to each end of the building and also suspended from the roof truss by disc strain insulators. If for any reason it is advisable to run one bank of transformers independently the high tension bus can be sectionalized by pneumatically operated disconnecting switches.

All high tension connections are made from ¾-in. copper tubing proven to be satisfactory and rigid as well as presenting a symmetrical and pleasing appearance.

The leads from the high tension bus to the main transformers have air-operated disconnecting switches between the bus and the transformer K-15 oil switches. Another set of disconnecting switches together with current transformers the secondaries of which operate differential relays, is placed in circuit between one end of the primary winding and the grounded neutral.

Openings in the walls of the transformer compartments have been left, together with disconnecting switches mounted on post type insulators to facilitate changing from "Y" to "delta."

Transformers.

The transformers are seven in number, one for each phase of the two incoming three-phase lines and one spare. They are of the standard oil insulated water-cooled single-phase type, each having a normal capacity of 3750 kw., primary voltage ratings of 138,500 and 104,000 when "Y" connected and several steps ranging from 40,000 to 120,000 when "delta" connected, the secondary voltage rating similarly varying from 12,000 to 3666 with delta connections and a primary normal ampere rating of 31.2 and secondary of 312.

These transformers are now being operated in two banks of three each, "Y" connected on the high tension side and "delta" on the low, stepping down from 104,000 to 12,000 volts. They have guaranteed efficiencies of 98.6, 98.5, 98.3, 97.8 and 96.0 per cent for

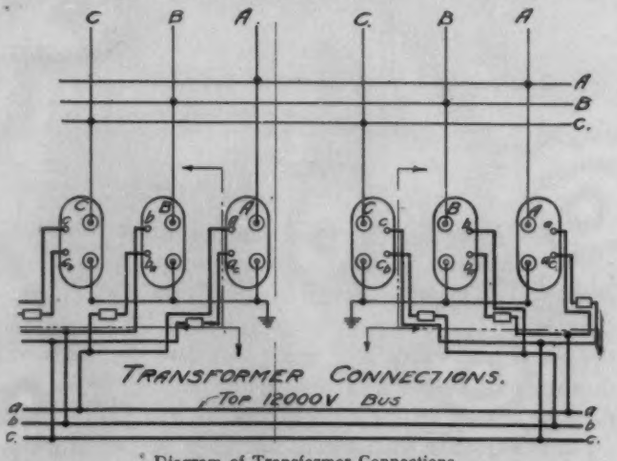
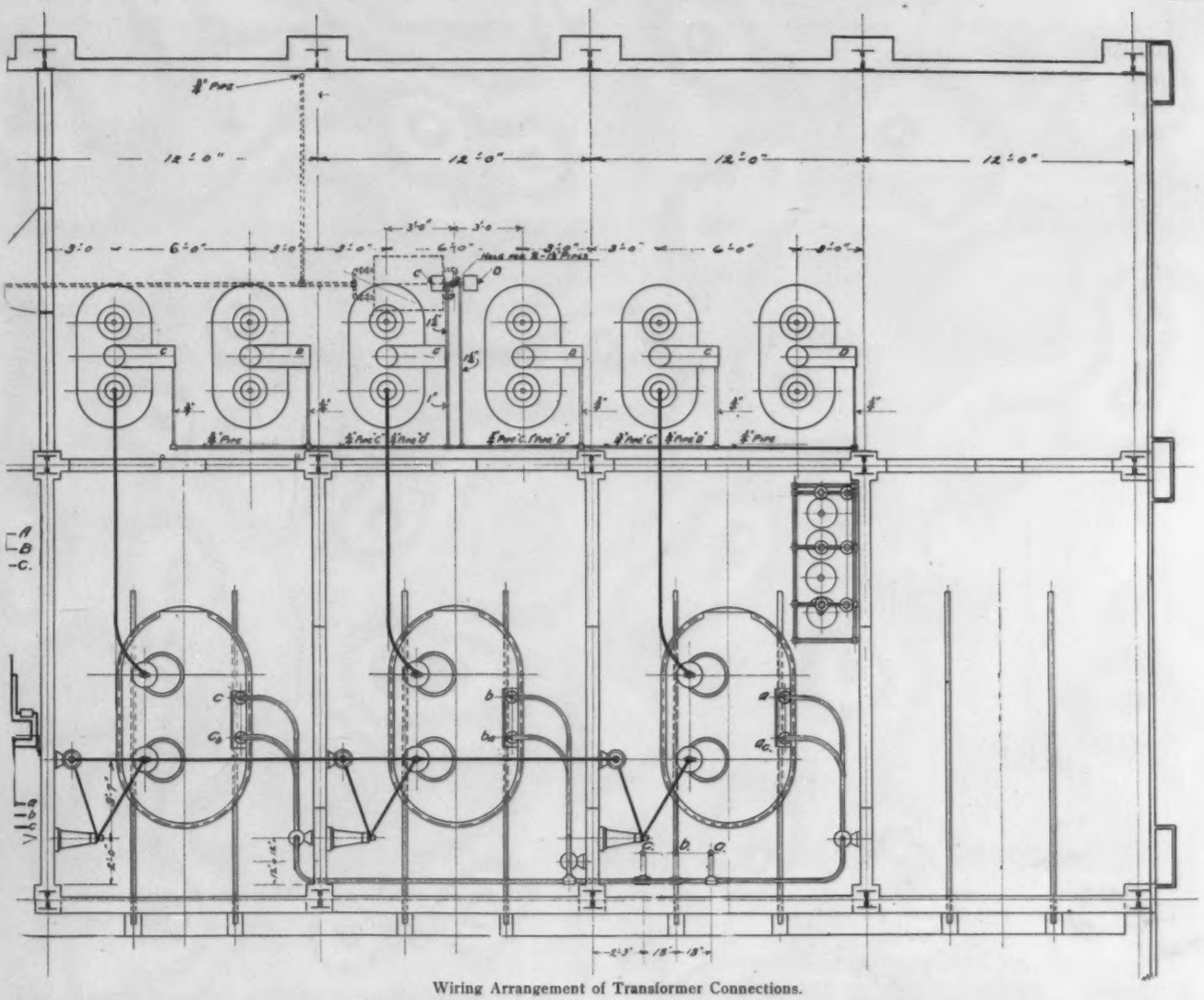


Diagram of Transformer Connections.

load and a quarter, full-load, three-quarters, one-half and one-quarter loads respectively. The non-inductive regulation is approximately 1.5 per cent at unity power factor.

They stand nearly 17 ft. high and occupy a floor space 10 by 6 ft., each being placed in a separate reinforced concrete compartment as shown in the illustration. Each unit complete with oil weighs 28 tons, 3100 gallons of No. 8 Transil oil and 20 gallons of water per minute being required per transformer.

The primary and secondary windings are subdivided into several coils, each built up of flat conductors arranged with one turn per layer so as to form thin coils presenting a large radiating surface to the oil. The excellence of the insulation is indicated



Wiring Arrangement of Transformer Connections.

by the 280,000-volt test which the coils successfully withstood. The low tension side is further protected with aluminum cell lightning arresters.

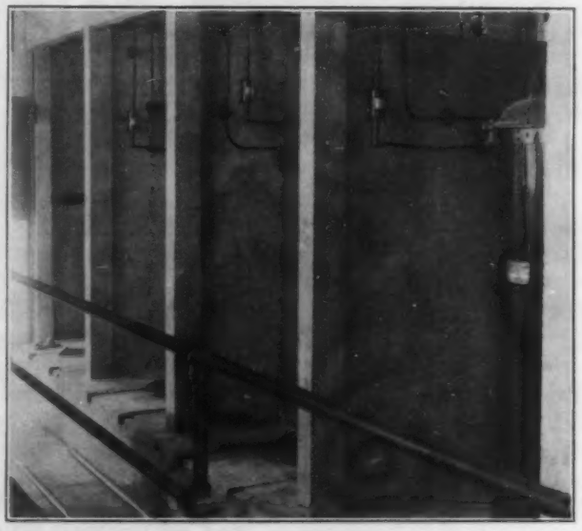
Other noteworthy features are the water-circulating system and the oil drying and purifying system.

Cooling System.

Water for cooling is pumped from a near-by well by means of a Krogh centrifugal pump driven by a 3 h.p. three-phase induction motor supplied from the station bus. Another centrifugal pump keeps the water continuously circulating through the copper cooling coils in the transformers and the spraying nozzles and cooling tank in front of the building. A duplicate set of circulating pumps is provided and the entire system has proven exceedingly efficient in cooling the water.

Oil Dryer and Purifier.

When it is necessary to purify the transformer oil, a quick opening valve allows it to flow from the transformer through a 4-in. pipe to a tank. By means of this apparatus it is possible to treat the oil while the transformers are in service. From this dirty oil tank the oil is pumped by a 2½ in. force pump driven by a 7½ h.p. motor to the filter press whence it passes into a clean oil tank and thence to the transformer through a 2 in. pressure pipe as shown in the accompanying sketch.



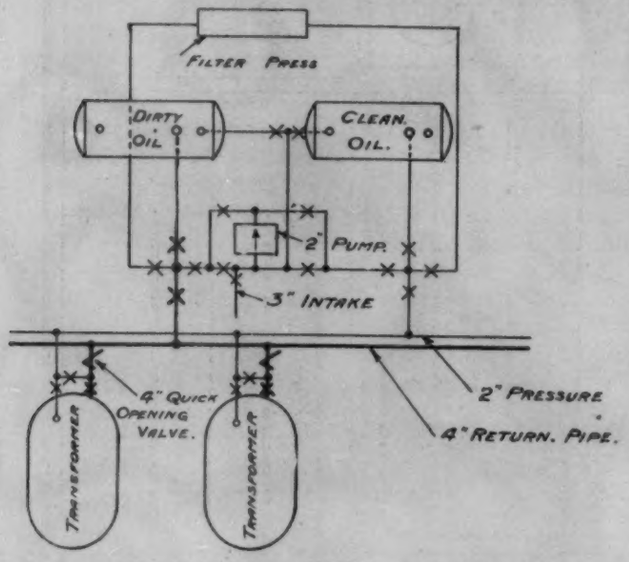
Main Transformer Compartments

This oil dryer and purifier consists essentially of a filter press, a pressure pump and an operating motor together with the necessary piping, valves, pressure gauges, etc. The press is made up of a number of alternate grids and chambers so arranged that sheets

of blotting paper may be clamped between them. By means of suitable channels and openings oil is forced into the chamber and through the blotting paper into grooves in the grids and finally out through the discharge pipe.

The filter paper catches all impurities in the oil and absorbs any moisture present, thus accomplishing a dual purpose. The foul paper is withdrawn and new paper readily inserted whenever necessary.

The press is 12 in. square, giving an area of 27 sq. ft. It is operated by a 3-h.p. three-phase induction motor, the pressure varying from 20 to 100 lb. per sq. in., depending upon the grade of the oil and its freedom from foreign matter. The outfit has a capacity



Sketch of Oil Dryer and Purifier Arrangement

of 900 gallons per hour and its total operating cost is considerably less than one dollar per thousand gallons of oil treated.

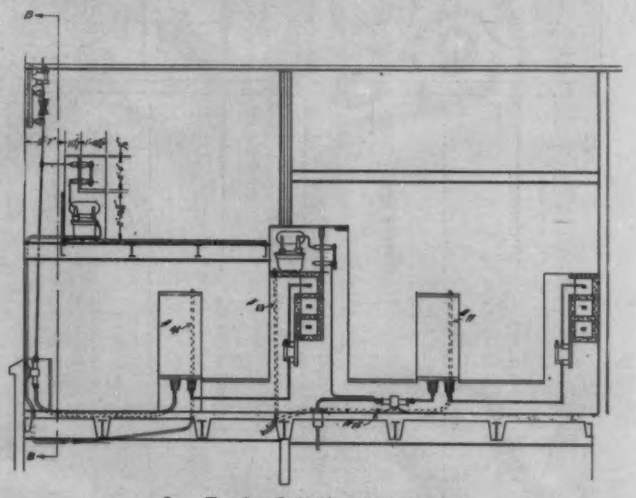
Low Tension Wiring.

Disconnecting switches have been placed in the main transformer secondary leads so that the system may be operated "open delta" if for any reason one of the transformer banks should be disabled by such an accident as a short circuit within a transformer which would set up large cross currents or surges due to the unbalanced condition. Current transformers have been connected inside the "delta" to operate the differential relay, which in turn governs the trip coils of both the type K 15 and type H 3 oil switches. The latter are placed in the 12,000 volt leads and are motor driven by direct current from a storage battery set. Taps are taken off just back of the oil switches to a set of aluminum cell lightning arresters with horn gaps carefully adjusted so as to relieve the system of any surging.

The transformer secondary type H 3 oil switches are mounted in concrete cells on a level with a false floor two feet above the main bus compartment floor, thus allowing ample clearance for the flat copper bar connections. All disconnecting switches placed in these connections are mounted in the bus structure in a vertical plane, giving an arrangement easily accessible for switching or repairs.

The transformer secondary, or main bus, runs throughout the length of the building dipping under the false floor at the center. The feeder bus parallels this main bus and both are sectionalized by type H 3 oil switches. Space has been left at the north and south ends for large capacity group oil switches, the manually operated disconnecting switches sufficing for the present.

The synchronizing and wattmeter potential transformers are mounted in concrete slab pockets placed above the buses, their fuses being mounted on insulator bases in a vertical plane convenient and safe for pulling or replacement. The feeder H 3 oil switches parallel the feeder bus, one set of disconnecting



Low Tension Switching Arrangement

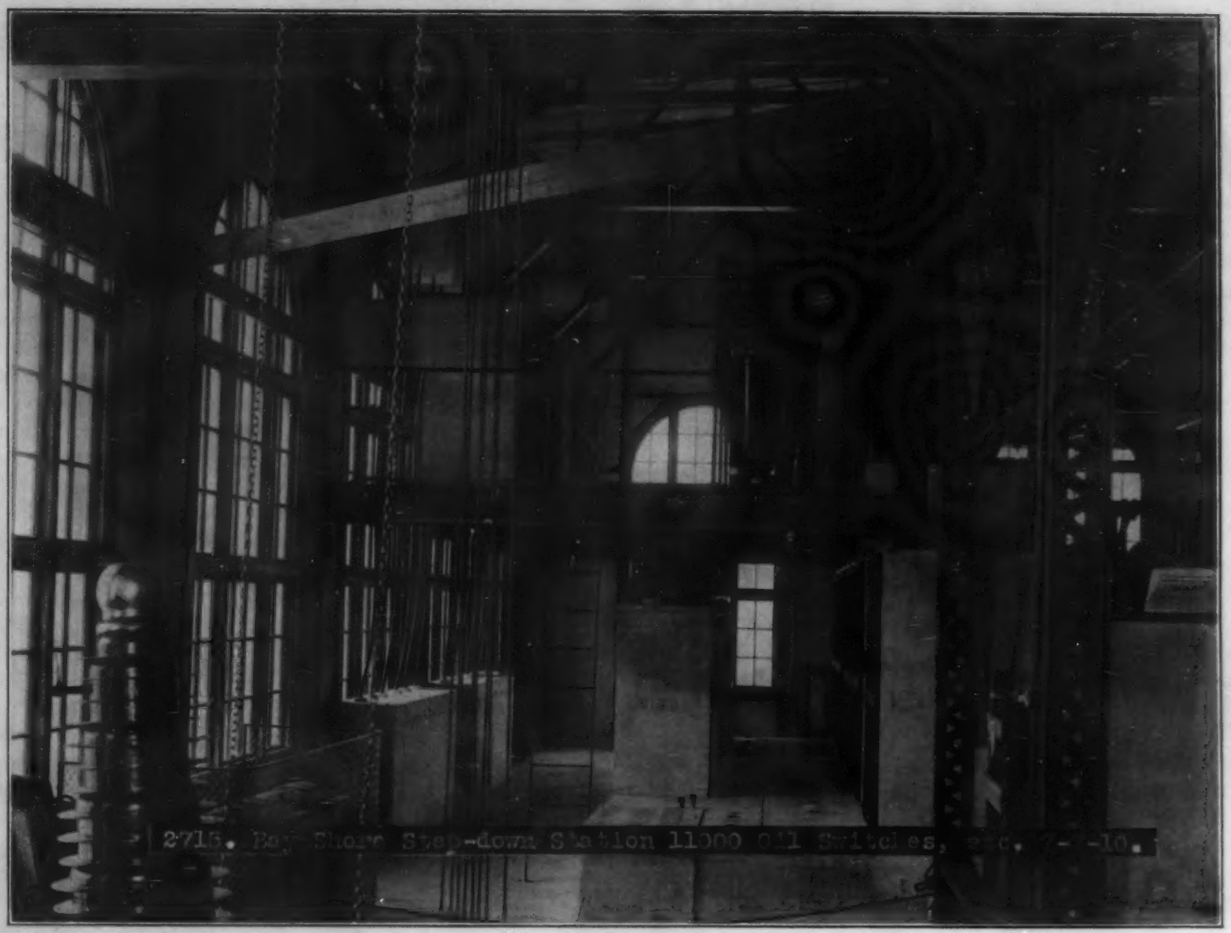
switches being mounted on the bus compartment and the other under the outgoing feeder exits, being operated by means of a switch stick from the feeder lightning arrester deck.

The feeder current transformers are mounted in batteries beneath the west side window sills, being totally enclosed with asbestos board. The feeder lightning arresters are on a deck ten feet above the bus compartment floor their taps being conveniently dropped from the dead-ended feeder. On this same deck are constructed the feeded potential transformer pockets with their fuses, taps for the transformers being taken from the outgoing feeders just below the choke coils.

Switchboard.

The switchboard gallery, together with the storage battery equipment under it, occupies the wing on the west side of the main building. The switchboard proper consists of two parts, a front section and a back section. The front section has a bench-board consisting of five panels and bench upon which the bus-bar system is laid out in miniature; the five panels include two line panels, two feeder panels and a tie panel placed between them.

The line panels control the two incoming 104,000 volt lines and are each equipped with one a.c. ammeter, having an 800 ampere scale and connected to a three way ammeter switch by which it is possible to determine the current upon each one of the three incoming lines comprising the circuit; one polyphase indi-



Low Tension Switches

cating wattmeter with a scale for indicating the wattless component, and one a.c. voltmeter with a 20,000 volt scale. All these instruments give readings on the low tension side.

The two feeder panels control the eight 12,000 volt, 250 ampere, three-phase feeder circuits, the instruments for four circuits being mounted upon each panel, including one a.c. ammeter with a 300 ampere scale, one polyphase indicating wattmeter with 6000 kw. scale, and one balanced three-phase power factor indicator with 60-100-60 per cent scale for each of the eight circuits.

The central tie panel is equipped with a synchroscope, a vibrating reed frequency indicator and an a.c. volt-meter with a 20,000 volt scale.

On the back boards are mounted induction recording and polyphase curve drawing wattmeters and curve drawing voltmeters for the corresponding incoming and outgoing lines. This board has been designed for future extension of station capacity and the addition of such other instruments as may be needed.

Storage Battery Equipment.

Current for lighting the building and operating the motor driven switches must be independent of any line break-downs and is consequently provided from a storage battery set charged by a motor generator installed under the switchboard gallery. The motor generator consists of a 5 kw., 125 volt shunt wound generator driven by a 110 volt three-phase 60 cycle 7½ h.p. induction motor. The motor is started through a compensator having its own switches and fuses. The battery equipment consists of 62 type E-7 "Chloride" accumulator cells. An independent switchboard or battery charging panel has been mounted nearby with the usual instrument equipment. Current for all power and lighting auxiliaries is derived from two banks, three each, of 60 kw. station transformers, stepping the voltage down from 12,000 to 110. Adjoining it is a board controlling all the station lighting and power equipment.

All the apparatus, except where otherwise noted was manufactured by the General Electric Company. The plant was designed and installed by Sanderson & Porter, Otto Falch superintending the local designing and William Hutton the construction. The editor is indebted to Geo. S. Johnson, who did much of the detail designing, for collaboration in preparing this article. This substation, together with the generating plant and transmission line is operated by the Sierra & San Francisco Company.

Examination for Civil Engineer and Superintendent of Construction is announced by the United States Civil Service Commission on September 14-15, 1910, to fill vacancies in the position of civil engineer and superintendent of construction, $1500 per annum each, in the Quartermaster's Department at Large, San Francisco, Cal., Fort Bayard, New Mexico, and Washington, D. C.

RATIONAL UTILIZATION OF WATER-POWER

BY J. J. BROWNE.[1]

We believe in conservation, but we are also in favor of progress and development. Our public lands should be used for the purposes to which they are best adapted, but not abused; the mines should be made to give up their wealth, but not destroyed; the timber should be cut in such a manner as not to wipe out our forests, and our water powers should be developed, as we need them for hundreds of civilizing purposes all over the Rocky Mountain and Pacific States.

To carry out the ideas of the ultra conservationists in this matter of federal control of our public lands and water powers, mineral, forest and other natural resources, would greatly retard the development of the Northwestern and Pacific States and Alaska, without adequate compensation to the nation as a whole. The average conservationist has been made to take an extreme position on this important question, owing largely to having only one-sided information. But there is another side, which, in fairness, ought to be understood.

The total horsepower of water in the United States is estimated at 66,518,500, and of this more than one-third is in Washington, Oregon, Idaho and Western Montana. Less than $500,000 horsepower is developed. It may also be noted that nearly all the remaining public lands are located in the Rocky Mountain and Pacific States and Alaska. East of the Mississippi river are 20,000,000 horsepower of water and only 4,000,000 developed.

In the Columbia river valley, between the Rocky Mountains on the east and the Cascades on the west, there is sufficient water for all purposes of the present day and for generations to come, including the operation of all the railroads and irrigation projects we shall ever need, all the manufacturing we shall ever do and all the cities we shall ever build. That water-power is so great that if 10,000 horsepower of it on an average should be developed every year, it would take, 2400 years before all of it would be in use, and when once in use it would be so for all time. If we were to harness 100,000 horsepower a year, it would require more than 240 years to develop all of it.

Water-powers are local and confined in their operation to comparatively small areas. Each community needs power to manufacture its raw materials. If the land upon which these powers are located is restored to entry under existing laws, the titles for the most part will go to bona fide settlers living in the several communities, and will largely be developed by local capital. Water-powers on public lands are not located in cities, but in the wilderness or in sparsely settled districts, and if the power should be a large one, it will take many years for its full development. No man can afford to devote his time and money developing such a power under a leasehold. He needs the title in fee simple. He is not building for himself alone, but for posterity.

[1]President of Western Conservation League and Chairman of Spokane delegation of National Conservation Congress in St. Paul, September 5 to 9.

The government should cancel its withdrawal of those lands and dispose of them to the people who need them and will use them. In the very nature of the case there can be no monopoly in this matter. The States respectively own the water in the rivers within their boundaries, subject only to the right of navigation, which is controlled by the federal government. This principle is so generally recognized that every well-read lawyer is familiar with the decisions of the courts justifying it.

Each State has full power to regulate the water-powers within its boundaries, and the federal government should either give the settler the title in fee simple to those lands, or turn the lands containing water-powers and coal and minerals, over to the States. The present policy is retarding development, and progress must soon cease unless it can be changed. The people should be given every opportunity to develop the country in which they live. As the State already owns the water, why should it not own the land also? All these lands, with coal and mineral and other deposits should be turned over to the States, which alone have the power to take and to regulate the industries that may result from these mineral resources.

Many water-powers in our territory, including a large number along the Snake river, have been withdrawn by the government recently, and the result today is that numerous projects to establish manufacturies are held up. Capitalists and owners of factories in the New England, eastern and middle western States would operate more mills and plants in our country, but under existing regulations, which I hold are unlawful, these men cannot secure the land they must have if they are to develop the power. Under the old law, which gave any person the right to select land and develop power, the water-power of the East has all been developed. It is in private hands and has been from the beginning.

What we desire is the opportunity for any man in the United States to come to our country and get water and otherwise assist in developing our resources. We do not want the country standing idle, and the water running to the ocean as it has been doing for countless thousands of years. The way to get population, wealth, revenue, cities, manufacturing establishments, churches and schools into our country is to develop these water-powers. Spokane, now a city of 125,000, has grown because it is built on an immense water-power. There are many other equally valuable water-powers in the Northwest and they ought to be developed. We should have cities of from 50,000 to 150,000 all over the western country and we would have them if permitted to develop the wealth at our doors."

An examination for inspector of construction is announced by the United States Civil Service Commission on October 5, 1910, to fill a vacancy in the position of inspector, qualified as a good all-round building inspector, male, at $900 per annum, in the Quartermaster's Department at Large, Fort Crockett, Tex., and vacancies as they may occur in any branch of the service requiring similar qualifications.

METHODS OF OBTAINING BUSINESS.[1]

BY A. C. M'MICKEN.

Probably no subject to be presented at this convention covers so wide a field and presents so many topics for discussion as "Methods of Obtaining Business," and certainly no subject has been more cussed and discussed by central station managers.

About ten years ago, in Denver, Colo., Henry L. Doherty conceived the idea of "going after" business for the central station instead of following the time-worn custom of letting the business present itself. This was the real beginning of the commercial department of central station business and you are all familiar with the wonderful success of Mr. Doherty's scheme. A few companies previous to that time had made weak endeavors toward commercial organizations, but none had conceived the organization perfected by H. L. Doherty and none had met with much success.

The commercial department is the first requisite in the business-getting game. Due to the extremely rapid growth of our Pacific northwestern cities aggressive commercial departments were not considered a neecssity until a few years ago. Central station managers had difficulty in caring for the wonderful natural increase in business and few could see where a commercial or new business department would be of much benefit.

We are all, now, fully aware of the absolute necessity of a business-getting department in both large and small cities. Especially is this true of the small plant even if the department consists of but one good man. Stations in cities of 5000 or more can afford a commercial man. It is manifestly unwise, if not impossible, for the small plant manager to add to his duties as superintendent, bookkeeper, and lineman, the work of commercial manager and solicitor. This is the age of specialization and trained commercial men are just as necessary as electrical engineers.

The good commercial man has established his position as of equal importance with the engineer, and who can say that the day is not near at hand when the commercial manager will overshadow the engineer. Commercial work no longer merely constitutes soliciting for business, but now in a great measure dictates company policy.

The regular commercial organization consisting of the manager, the district representatives or solicitors, the power man, the sign man, illuminating engineer, and other specialty men is doubtless familiar to all of us. It is needless to say that the success of the commercial department depends entirely upon the personel of the men composing it and the support given it by the company.

One of the greatest assets in getting business is publicity—advertising, if you please. Many central stations are slow to realize the benefits of intelligent, educating, interesting advertising. Educate the public to the necessity of electricity and variety of its application and you have paved the way for your representatives "call" which is sure to show unexpected results. Many central station managers use a little space in the daily papers for the sake of friendship of the paper, and usually run some hackneyed phrase year in and year out. This is not advertising. Both newspaper and bill-board advertising can be used with the most gratifying results. Illuminated bill-boards calling the attention in a concise, catching way to electric heating and cooking devices and high efficiency lamps have proved their worth. In newspapers, bulletins should be run familiarizing the public with operating as well as commercial conditions. Other bulletins should also be published explaining the operation of motors on various power applications, the use and design of cooking and heating utensils, fans, high efficiency lamps, the necessity of scientific illumination of stores and other buildings, and decorative lighting. "Flyers" should be enclosed with the monthly bills calling attention to some particular household device such as toasters, irons, etc. Most of the largest central stations in the country, such as New York, Boston, Chicago, and Philadelphia advertise very extensively in these ways with most gratifying results.

The display room as an advertising and business getting medium must not be overlooked. Too much stress cannot be laid on the value of such a room. In Portland we have a demonstrator on duty at all times to give practical demonstrations of the use and efficiency of various heating and cooking utensils. Her reports for the first six months of this year show that her sale of electrical devices has averaged better than $600 per month; this does not include the ordinary sales made in our electric store but only her personal work. That the addition of this class of business to our load is most desirable goes without saying.

In many of the larger cities of the country, the display room is combined with a retail store where most of the devices displayed are also sold. Chicago, Boston, Philadelphia, St. Louis, Denver and others follow this method. In most of these places standard retail prices are maintained and the stores are self-supporting and profitable. In a few cases goods are sold at cost with a view of stimulating sales. It is believed that this practice is bad as it interferes with exploitation by supply dealers, and destroys their interest. If central stations sell appliances, it should be at regular retail prices.

Many central stations sell current consuming devices on installments which is unquestionably a good scheme if closely watched for credit. Chicago recently distributed 2500 electric toasters, payments being made at $0.40 per month for 12 months. Collections were made with the monthly lighting bill.

We have recently tried what we call "District Demonstrating" with excellent results. In different parts of our city arrangements were made to hold demonstrations of electric heating and cooking devices in the leading grocery and mercantile stores. Cards were mailed to the house-wives in the territory in which the demonstration was to be made inviting them to attend. An attractive window display of electric devices was installed and the demonstration lasting one or two weeks was conducted by our regular demonstrator. All manner of devices were on sale, a percentage of the profits going to the proprietor of the store, thus compensating him for the floor space used. A solicitor was also on duty at all of the demonstrations and a large amount of residence lighting was se-

[1] Paper read at convention N. W. Electric Light & Power Association, Seattle, Wash., Aug. 26-29, 1910.

cured solely through the desire of the housewives to use electric irons and other devices.

The securing of residence business has been a popular topic for discussion for some time past and numerous articles have been published in the various electrical journals which have thoroughly covered this very interesting problem.

From the number of inquiries received I find that many central station managers have asked, "To what extent is the central station justified in doing free wiring?" This question arises from the fact that in many of our cities a large number of the older residences and buildings have never been wired, due either to the gas company being in the field first, or to the fact that at the time of building electric lighting rates were prohibitive. We believe it is both unnecessary and unwise for the central station to do any free wiring.

One of the members of this Association informs me that he was able to add more than 1000 residences to the load of the central station by wiring the houses at cost for the consumer and allowing him to pay for this wiring in monthly installments covering a period not longer than five months. This was all done without loss to the central station.

Probably the most essential requisite to all central stations is a good "power" load. By the word "power" I mean all uses for electrical energy other than for ordinary lighting. This is the most difficult business to secure and it is at the same time the most desirable from every viewpoint. In thinking of the word "power," motor applications first come to mind. I believe that none of us have had much difficulty in securing small motor loads, for the public generally realizes that no drive compares with the electric motor in efficiency and cost of operation for small power purposes. Our greatest difficulty arises in securing power business from the larger manufacturing industries who have sufficient load to warrant the installation of steam or other motive power than electricity. Six years ago in Portland the motor load consisted of about 400 motors aggregating about 3500 horsepower. This load consisted mostly of electric elevators and small motor installations, machine shops, printing shops, etc. Owing to the low price of fuel easily obtained from the numerous sawmills in the city, most of the larger manufacturing concerns were operating by steam. Fuel oil at that time sold for 65c per barrel. A systematic campaign was instituted to win over as much of this business as possible. All of the different manufacturers were classified under their respective business, foundries, machine shops, printers, planing mills, brick yards, etc. Data was secured showing the hours of operation, the amount of power used and the approximate operating expense. If the engines or boilers were old or in poor condition special note was made of this fact and these firms were placed at the head of the list as the best prospects.

Literature on electric drive was mailed from time to time and in this manner much interest was aroused. Personal solicitation and good hard work won over a majority of these concerns, but a number of the larger manufacturing firms could not be reached. The company then decided to put in three or four complete motor installations in some of the largest and most representative factories and assume all the expense of a ninety-day trial. If the installation proved as represented at the end of ninety days, the customer was to purchase same outright; if not satisfactory, the company was to bear all expense. This was done and proved entirely satisfactory. Numerous manufacturers who had previously been very skeptical were now ready to talk electric power and new confidence in the company was inspired.

A special power man is always in the employ of the company who not only looks out for every opportunity to install electric drive, but also makes suggestions for bettering the installations of present customers. In many instances he is called upon to "lay out" the entire equipment of machine shops, factories, etc. This, of course, presents splendid opportunities for applying motors. Very friendly relations are maintained with machinery houses, architects and engineers, and through them new business opportunities are located promptly.

As a result of systematically following up power prospects we have at present a motor load aggregating 25,000 horsepower.

Other uses for electric energy which may properly come under the heading "power" and which are more or less special applications and must be treated as such are, mercury arc rectifiers, battery and automobile charging, cooking, heating, and industrial appliances; dental and tonsorial apparatus, artificial refrigeration, vacuum cleaning, blowers, musical instruments; the use of current in hospitals, bakeries, confectionery and ice cream factories, etc. In securing this class of business it is essential that a trained man be employed to devote his entire time and energy to this work.

Too much attention cannot be given to the electric automobile business. Some stations are selling "electrics" keeping one or more men soliciting and having a car on display in their display room and demonstrating to customers as desired. Some maintain a charging and repair station. Others co-operate with dealers by running strong ads in the newspapers. It is rapidly becoming a large factor in current consumption and no station can afford to overlook it. It is new business of the newest kind.

Of the lighting business, the long hour burning "commercial" customer is the most desirable. Multitudinous are the ways of securing patronage and too much credit cannot be given the solicitor who works in the business territory. A knowledge of illuminating engineering is very essential to the solicitor in the business territory as his suggestions for better illumination are usually gratefully received and are the means of securing and holding many desirable customers.

In the larger cities I believe that the Illuminating Engineering Department is an absolute necessity. The work done by the Illuminating Engineering Department in Portland in the three years past fully bears out this statement. At the present time three men comprise this department. Their entire time is devoted to improving the standard of illumination, both of business already on our lines and new business about to be added. They are in close touch with all of the architects and so friendly are our relations that with one exception all of the architects submit the plans of new buildings and stores to us for complete lighting schemes and specifications. In this way we are able to encourage better illumination, to hold

up the wattage where high efficiency lamps are used, and best of all, to have satisfied customers on our books.

In Portland the introduction of high efficiency lamps has been a boon and not a detriment. They have made it possible for us to successfully compete with gas both in illumination and in cost. Hundreds of gas arcs have been replaced with the Mazda lamps and it has been possible to add much desirable business on already established lines. In almost every instance where arc lamps, Nernst lamps, gem and carbon filament lamps have been replaced with the Mazda lamp, high efficiency lamps of equal wattage have been installed on the basis of more light for the same money.

Controlled flat rate service which includes sign and bill-board lighting, window lighting and ornamental street lighting is most desirable both from the viewpoint of income and load. In the year past we have been paying particular attention to sign and boulevard post lighting. This class of business brings a revenue of $111.50 per kw. year and is also most valuable advertising. Of the two, post lighting is the hardest to secure, as our company did not care to carry an investment of from $75.00 to $100.00 per post and great difficulty was experienced in selling the posts to the customer. We finally evolved a scheme of organizing street improvements associations composed of all the property owners on a street. This was done by inducing the property owners who were favorable to boulevard post lighting to call a mass meeting of the property owners on their street on one pretext or other, thus giving us an opportunity to present the plan.

This was first done on Seventh street and so enthusiastically was the plan for lighting Seventh street received that the property owners incorporated under the name of the Seventh Street Improvement Association and we secured the illumination of the entire street—the association buying the posts and contracting with us to light the same for five years. A few of the property owners who were not in favor of this lighting were soon brought into line by the owners of adjoining property. The illumination of one street create a demand for this lighting on other streets and where we were not successful in forming street associations, we were able to sell the post to the individual property owner. In no case was less than a five-year lighting contract made. At the present time we have installed some 445 posts.

Many central stations have special electric sign departments where signs are designed, built and sold to the customer. Some central stations rent or lend electric signs to their customers but this plan is open to many objections. It is unquestionably better to have the customer own his sign, for he will not be so ready to have it taken down if he tires of it and he will be more particular about having "something different" from his competitor. In electric sign business "variety" is an absolute necessity. Nothing will kill sign business so quickly as a sameness of appearance and design.

I wish to emphasize the neecssity of trained commercial men. Too much value cannot be placed on the services of competent, versatile commercial representatives, as no business requires a greater knowledge of more subjects than central station commercial work.

Summarizing.

Constant solicitation on established feeders. Ample, trained, soliciting capacity to see and develop new fields. Advertising in attractive and varied form. Display rooms well equipped with current consuming devices. Popular demonstration of electrical applications. Engineering advice available free to customers.

Let us hope that the future sessions of this convention will devote more thought, more interest, and more time to this important feature of central station management. The Commercial Day session should and must be given more prominence. Let us have it a clearing house of information that will be of inestimable value to every member of this association.

ITALY'S ELECTRICAL UTILIZATION.

Continued activity is noted by Consul John Q. Wood of Venice in the exploitation of new hydro-electric plants of North Italy. Work is progressing rapidly on the 9000-h.p. works at Ponte della Serra in the Province of Belluno, under the direction of three electrical companies, one of which is the Edison (Italian company), whose central office is located in Milan. The Milani hydro-electrical plant, producing a force of 10,000 horsepower, was inaugurated in November, near the city of Verona. The electrical equipment was supplied by the Westinghouse Company of Havre.

Electric car lines are springing up in all parts of this district, enormously stimulated by the cheap electric power. The State frequently subsidizes these companies, as in the case of the line from Belluno to Pieve di Cadore, which will receive $115 per kilometer (0.62 of a mile). Railroad activities are also progressing. The line from Bologna to Verona is nearing completion, much to the regret of the citizens of Padua and Vicenza, for these cities will be cut off from the international line to and from Milan and Bologna, and incidentally Venice will lose many visitors who have been accustomed to stop off at Padua and pay a little visit to Venice before proceeding north or south

Examination for electrical assistant is announced by the United States Civil Service Commission on October 5, 1910, to fill a vacancy in the position of electrical assistant in the Signal Service at Large, at New York City, at $1500 per annum, and vacancies requiring similar qualifications as they may occur in any branch of the service. The examination will consist of practical questions in electrical science, practical questions in the installation of electrical instruments and construction, with particular attention to cable installation, inspection and testing, training and experience. Applicants should be thoroughly familiar with the practical side of electricity as applied to telegraph, telephone, and cable engineering, and should have a practical knowledge of the methods of manufacture of subterranean, aerial, and submarine cables, both rubber and paper insulated, and insulated wires of various kinds, and of the properties both physical and chemical of the substances used in the process of their manufacture.

HOW CAN A PUBLIC UTILITY CORPORATION BEST SECURE AND RETAIN THE FAVOR OF THE PUBLIC?

BY EDITH T. TAYLOR.[1]

A public service corporation, working on the right principle, desires the friendship of the people it serves and of the public at large. It is not the individual alone, it is the corporation that wants the favor of the city that gives them a franchise; to win the approval of the City Council, not merely for the good it will do them, but for the sake of promoting good fellowship. It courts the favor of the newspapers, who can, in a few lines, make or mar a situation which is all-important to the company. All these things conspire to win approval, and approval begets friendship.

The public service corporation is not, and cannot be a success, without friendship—for it is the spirit of the age to make an artistic triumph of the business in which we engage, which cannot fail to excite the respect and admiration of the world we serve, and respect and admiration are synonymous with friendship. And it is more and more realized that without friends a business cannot continue to rise and grow to the benefit of those vitally interested. For a time a company may hold full sway and conduct things in a high-handed manner; but by and by the field is entered by competitors, who will play merry mischief with the concern which is not safe-guarded by the warm friends that should rightfully belong to it.

Any business appreciates that first necessity, to produce goods which are pleasing; and, second, to render a service that is satisfactory. The public service corporation faces a difficult proposition, as compared with other types of business, inasmuch as its field is so large that there is the greater chance of complaints; but consistant endeavor must be exerted to smooth out all troubles and satisfy all complaints. The public utility must market a perfect product, or, if not perfect, it is as nearly so as science and inventive genius have up to the minute made possible. It must, then, strive to give satisfactory service, and every conceivable opportunity to improve either product or service is to be grasped with avidity.

The human mind is constantly evolving schemes (we call them inventions) which the manufacturers, always on the alert for improvements, hear of, investigate, and, finding acceptable, adopt. The public may well be kept advised of the addition or advancement, as may be the case, and it will watch results eagerly. People are in the main charitable, but they like once in a while to be taken into the confidence of a corporation, whom they are all too ready to conclude is guilty of dark conspiracy. Make a bid for their interest and sympathy. Let them know about some of the obstacles that a big service has to meet and overcome, and arouse their interest by our efforts to please. The attitude of aloofness is, I believe, much too prevalent among the public utility corporations.

Therefore, with never-ceasing ambition to make its product as highly satisfactory as money and brains permit, the major consideration is how to give service to the consumer that shall be above approach.

Here comes in the power of the employes. The outside men are chosen on account of their fine appearance, aggressiveness, desire to please and general "snap." Armed with an absolute and thorough knowledge of the business they represent, they go out to face our consumers. They are the firm's best asset, the representative in every sense. They must be courteous under all circumstances, patient and long-suffering many times; they must be sympathetic, interested and strive to win, if not a customer, at least a friend.

Other employes meet the consumer in other ways, and most important is the attitude of these employes toward the company. All at times have their grievances, real or fancied, but these should never be aired in public. A spirit of loyalty should at all times possess the conscientious employe, and he should never fail to speak well, and with praise, of the company for which he works and from which he gets his pay.

The public utility has always a carefully organized complaint department, probably the most important department from the standpoint of winning and keeping friends. Assuming that such a department is backed by an honest purpose on the part of the company, which is absolutely essential, each member of the complaint department meets the consumer, not alone with the courtesy which pleases, serious interest in the trouble exhibited, and with an assurance of ready relief and thorough attention to the complaint, but is able furthermore to know that every assertion he makes is going to be backed up by the other departments, which, with the all-imperative co-operation their employers insist upon, will each do his part to see the matter through to a conclusion to make an absolute adjustment of the trouble. But we must not rest here. We must not lose the interest we have aroused in ourselves, nor suffer the approval of the erstwhile complainant to lapse and grow cold. We must keep after the matter, communicating with the consumer to let him feel that it is as much a matter of weight with us as if it personally concerned ourselves. We will make a friend and keep him. And one friend gained is of inestimable benefit, and, after all, our best advertiser. The world is full of kind hearts, and there are very few people who would not rather be friends than enemies, no matter to whom or what.

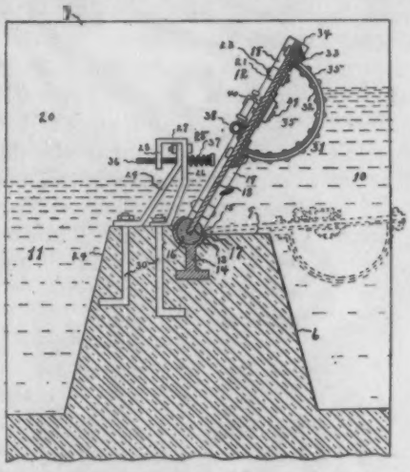
Courteous treatment of the public at the company's place of business, I think, does more to create a favorable impression than many realize. Put yourself in the customer's place. We all like to go into a place of business where we don't have to wait-and-wait, while an employe stands in a pre-occupied manner, giving attention to something that might better wait a time. We like to be treated as though our patronage is valued; in short, we like attention. It is human nature, that's all.

All departments, working together, form a high class institution; keen business men are quick to note the careful, businesslike methods. Bill payers appreciate the efforts to set right an error and save further difficulties, and adverse criticism is turned to praise, so that we will one day, and in the very near future, be able to adopt the slogan of a notable advertiser and say, "We are advertised by our loving friends."

[1]Paper in the Prize Competition instituted by the Spokane Falls Gas Light Company.

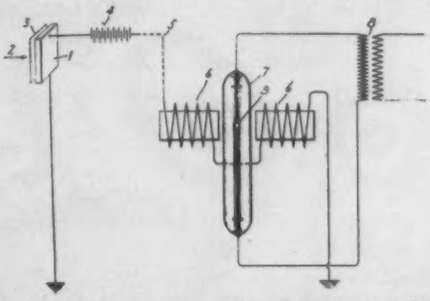
PATENTS

968,082. Movable Crest for Dams. Phillip Savard and Arthur Savard, Omaha, Neb. In combination with a water dam, a rectangular barrier plate disposed longitudinally of and having a mounting of one of its edges upon said dam, one of its



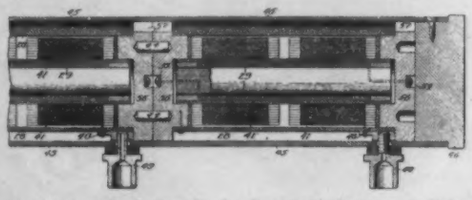
sides near its opposite edge being provided with hollow, airtight compartments; and a plurality of upright braces disposed in alinement adjacent to one of the sides of said barrier plate, said barrier plate adapted to have upwardly and downwardly swinging movements intermediate the upper ends of said braces and the other surface of said dam.

968,484. Telephotograhpy. Osias Otto Kruh, Schenectady, N. Y., assignor to General Electric Company. In a telephotographic system, a luminous tube having a light transmitting



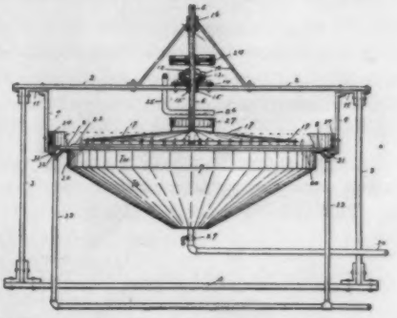
window, and electromagnetic means for varying the intensity of light at said window to correspond with the variations in current received from a distant point.

968,173. Spark-Coil. August R. Luschka, Chicago, Ill., assignor to Western Electric Company, Chicago, Ill. An induction coil consisting of a spool provided with a primary and a secondary winding, each end of said spool being provided



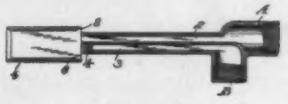
with a plurality of channels in its periphery, each spool end being further provided with a radial channel communicating with one of said other channels, terminal clips for the primary connections arranged in said radial channels, and a secondary terminal plate carried by said spool.

968,206. Art of Separating Liquids and Apparatus Therefor. Lawrence Strom, Los Angeles, Cal. A process for physically separating oil and water in admixture into its constituents, consisting in feeding said mixture onto a rapidly revolving surface, ejecting said mixture from said surface by



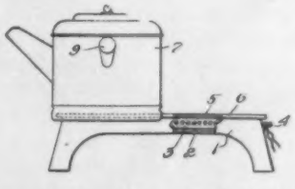
centrifugal force, dividing the ejected mixture into spray and drops by projecting it against an obstacle, and leading the oil of the mixture along the surface of said obstacle to a receiver leaving the water of said mixture to be separately dealt with.

968,281. Oil-Burner and Draft Appliance. Fred A. Stevens, San Francisco, Cal. In an oil burner, the combination of a pipe, the front end of which is divided by a horizontal partition into parallel steam and oil passages, said passages having greater width than height and one of said passages having a steam inlet and the other an oil inlet, a barrier at the front end of the steam passage extending across the same, to a point adjacent the partition so as to form a narrower passage



for the escape of steam, said barrier being disposed just beneath the discharge end of the oil passage whereby the jet of steam will receive the oil as it is delivered from its passage and will drive said oil forcibly forward and atomize it and mix it with the steam, and a casing or box-like extension fitted to the front end of the pipe in line with said passages, said extension having a height in excess of that of the front end of the pipe whereby openings are formed above and below the pipe for the entrance of air for admixture with the oil and steam.

968,441. Electric-Heater Combination. James I. Ayer, Cambridge, Mass., assignor to Simplex Electric Heating Company, Cambridge, Mass. The combination with a heater provided with a flat-top heating plate having electric heating resistance secured to its under side, of a utensil whose contents



is to be heated, one of said parts having opposite parallel longitudinal flanges substantially co-extensive with the length thereof for embracing and retaining the other part in relative snug sliding engagement in the direction of said longitudinal flanges.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

E. B. STRONG, President
A. H. HALLORAN, Vice President and Managing Editor
C. L. CORY, Secretary.

DIRECTORS

R. J. DAVIS A. M. HUNT A. H. HALLORAN C. L. CORY E. B. STRONG

604 MISSION STREET, SAN FRANCISCO

EASTERN OFFICE, 150 NASSAU STREET, NEW YORK
C. N. MANFRED, Eastern Manager
LOS ANGELES OFFICE, 107 SECURITY BUILDING

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.10
Single Copies, prior to Current Month	"	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

Bay Shore Substation 207
Rational Utilization of Water Power..... 214
By J. J. Browne.
Examination for Inspector of Construction..... 214
Methods of Obtaining Business 215
By A. C. McMicken.
Italy's Electrical Utilization 217
Examination for Electrical Assistant..... 217
Securing Public Favor for Public Utility Corporations 218
By Edith T. Taylor.
Patents. 219
Editorial 220
Modern Power Systems.
Personal 221
Trade Notes. 221
Industrial 222
The Operation of the Newest Telephone Selector.
A New Form of A. C. Elevator Motor Controller.
News Notes. 224

Modern Power Stations

In the days of old, when man obtained light from the tallow dip, transportation with his own horse, water from his spring, and in fact provided independently for himself his few conveniences of life, there was no necessity of cooperation with anybody as far as he was concerned, his life was independent to a great degree and there was no necessity for him to consider anyone else or to work with his neighbor to make existence tolerable.

The hamlet as well as the metropolitan city is now provided with water, fuel, light and power from an installation which in the majority of cases is but a part of a great system. In meeting fully and adequately the needs of the people the efforts of a great many men of widely different professions and occupations are necessary. Nevertheless, each must do his part properly and accurately, at the same time not losing sight of the necessity of adapting his plans to the requirements of his associates. Expert engineering ability of the highest type must go hand in hand with capable business management and the financial problems also require the most capable handling.

The great electric power system begins with a proper conception of the opportunity. No one, whether engineer or financier, not naturally endowed with imagination and good judgment should be followed very far in a proposed utilization of natural resources or the development for commercial purposes or a newly found principle. Granted, however, that the work to be done will be of real value in the future, one is almost overwhelmed when he begins to consider the degree of engineering ability and financial acumen, coupled with sound business judgment and a proper consideration of the rights of the people, which are necessary for the real success of a great corporation such as an extensive light and power system, with which the great cities of the East and the more scattered civilization of the West are both becoming more and more familiar every day.

As a necessary part of such development there is constantly before us the relation of municipal, state and national government with such private enterprises. It is evident that in the end the best results can only obtain if complete and unqualified co-operation actually results from the composite efforts and work of all concerned. Unreasonable delays invariably result in loss of time, money and opportunity. If one wheel of the system is inoperative, whether from ignorance, malice or any other reason, the success of the plan is jeopardized.

What a degree of respect we should have for the work of those to whom credit is due when contemplating the extent of the development of, and excellent service rendered by, any one of the great electric power systems, embracing all kinds of prime movers, that are so common in every quarter of the globe. In every instance one can be assured that the best efforts of engineers, managers and financiers have all been freely given to transform the brilliant idea of someone with a great imagination into the physical and material development which is represented by the complete installation with all of its intricate details ready to serve a great people. If it should happen then that in our daily life we are fortunate enough to be a small part of the great machine of progress in the engineering world, we should not forget that our work must of necessity be supplemented and in many cases upheld by others whose responsibilities are directed in an entirely different line. It is necessary to wisely and without hesitation separate the true from the false, the reasonable from the unreasonable, the sensible from the foolish. To be wrong and to fail to right oneself when given the opportunity is a crime of which no engineer, general manager, financier or public official should ever be honestly convicted if the material progress of the latter part of the nineteenth century is to continue throughout the twentieth.

PERSONALS.

Charles C. Moore, of Chas. C. Moore & Co., has returned to San Francisco after an outing at Lake Tahoe.

E. G. Dewald, of the sales department of the Pelton Water Wheel Company, was at Los Angeles last week.

Geo. P. Cooley, of the firm of Buxbaum & Cooley, of Seattle, has returned from an extensive trip in the Eastern States.

Emory Wishon, assistant manager of the San Joaquin Light & Power Company, of Fresno, spent the past week at San Francisco.

H. C. Goldrick, San Francisco, manager of the Kellogg Switchboard & Supply Company, spent the past week in the Pacific Northwest.

Melville Dozier, Jr., assistant manager of the Northern Electric Railway Company, has returned to Chico, Cal., from an extensive Eastern trip.

W. G. Clark, consulting engineer for the North Fork Power Company is superintending the company's hydroelectric plant near Dawson.

R. F. Monges, electrical engineer with the General Electric Company's Portland office, is spending his summer vacation with relatives at Berkeley, Cal.

J. W. White, sales engineer with the San Francisco office of the Fort Wayne Electric Works, is spending a two weeks' vacation in the Santa Cruz Mountains.

George W. Bacon, of Ford, Bacon & Davis, electrical engineers of New York, arrived from the East last week and visited his firm's San Francisco office.

E. C. Jones, manager of the Gas Department of the Pacific Gas & Electric Company, returned this week from an extended tour of the principal Eastern cities.

I. P. Jones has resigned from the U. S. Reclamation Service at North Yakima, Wash., to join the staff of the Sacramento Valley Irrigation Company at Willows, Cal.

J. Hyderdahl Hansen, a hydraulic engineer with the Pelton Water Wheel Company, has just returned to San Francisco from Europe via Seattle, accompanied by his bride.

Cards are out announcing the marriage of Miss Adelaide L. Weiner to S. P. Russell, assistant manager of the electrical department of H. W. Johns-Manville Company's San Francisco office, on August 17, 1910.

H. A. Mitchell of San Francisco, who is secretary of the Central California Traction Company, was at Sacramento August 29th, on the occasion of the opening of the new 52-mile electric railway line from that city to Stockton.

E. L. Haines, electrical engineer with J. G. White & Co., of New York, was recently at Fresno, consulting with A. G. Wishon, manager of the San Joaquin Power Company in connection with the extension of the power lines into the Midway and Sunset oil fields.

Thomas Mirk, of Hunt, Mirk & Co., who recently returned from a trip to the Westinghouse Machine Company's plant at East Pittsburg, left San Francisco for San Diego during the past week. His firm is installing a turbo-generator plant for the Consolidated Gas & Electric Company of San Diego.

C. K. Durbin, general manager of the Federal Light & Traction Company (the holding company for Sanderson & Porter of New York) which owns a number of electric power and railway plants throughout the West, paid a visit to the firm's San Francisco office during the past week on his way south. He will next visit the company's plants at Tucson, Ariz., and Albuquerque, N. M. Other plants held by his company are at Las Vegas, N. M.; Hoquiam, Wash.; Aberdeen, Wash.; Hobart, Okla.; Montrose, Colo.; Sheridan, Wyo., and Rawlins, Wyo.

TRADE NOTES.

The Fort Wayne Electric Works have a contract for installing two 35 kw. 2-wire, 250 volt turbo-generator sets, together with balancer set and complete switchboard control at the Children's Hospital, San Francisco.

The General Electric Company reports the sale of a horizontal Curtis turbine generator set to the O'Connell Lumber Company, of Winlock, Wash. It is rated as follows: A. T. B. 4, 1200 k.v.a., 1800 r.p.m., 480 v., with a C. C. 2, 35 kw., 3600 125 v. shunt wound Curtis turbine exciter.

The Sierra & San Francisco Power Company has purchased of the General Electric Company one C. C. 4, 125 kw., 2400 r.p.m., 125 v., 1125 v, compound wound, horizontal, d.c. Curtis turbine, which is to be used as an exciter in connection with the two 9000 kw. Curtis turbine generator sets at the North Beach power station.

Chas. C. Moore & Co. have been awarded the contract for installing the new electric power plant on Alcatraz Island, San Francisco, Bay, including boilers, engines and generators. The latter consists of two 3-wire, 250 volt 50 kw. engine type generators, to be furnished complete with switchboard by the Fort Wayne Electric Works.

The Westinghouse Electric & Manufacturing Company has shipped to Dawson for O. N. G. Treadgold of the North Fork Power Company, a complete 6000 kw. electric plant, including two 3000 kw. water-wheel driven generators, 60 cycle, 2300 volts, 514 r.p.m., motor-generator set and 5-panel switchboard. The power company will supply electricity for dredging and mining.

The Pelton Water Wheel Company has closed a contract with the Stevens City Power and Light Company for high-class equipment for a hydroelectric plant at Myers Falls, Wash. It consists of a 550 h.p. (max.) Pelton-Francis water-wheel, with bronze runner and Pelton oil-pressure governor direct connected to a General Electric generator. The president of the company is A. H. Sperry, who is also assistant traffic manager of the Spokane & International Railway.

The Pelton Water Wheel Company reports closing a contract with the Telluride Power Company for a 1200-h.p. Pelton water wheel, for the purpose of increasing the capacity of the Howard's Fork installation. The wheel will be of special design so as to operate at two different water pressures at different seasons of the year and at the same time secure the maximum efficiency. The already large development of the system supplying the power to the Telluride and Ouray mining districts of Southern Colorado will be increased by the above amount. L. L. and P. N. Nunn, the engineers of the 100,000 h.p. Ontario development at Niagara Falls, have charge of the work.

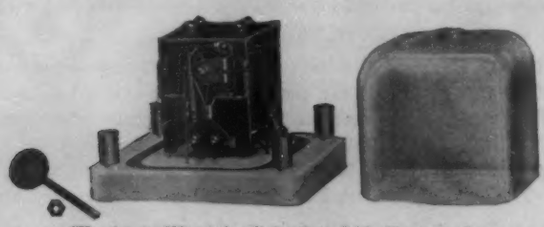
The Industrial Engineering Company of Portland, Ore., was incorporated May 1, 1910, to engage in the general business of engineers and manufacturers' agents. They are the exclusive northwest agents of the Humphrey Company of Kalamazoo, selling a full line of the well known Humphrey gas heaters; the exclusive northwest agents of the Ideal Manufacturing Company of Detroit, Mich., handling a full line of gas ranges and Ideal plumbing goods; northwest agents for the Samson Iron Works of Stockton, Cal., and are just installing for them one of the largest office building lighting and power plants on the Pacific Coast, made up of Samson four cylinder gas engines; two units driving 75 kw. Westinghouse generator, one unit driving 100 kw. Westinghouse generator. These engines furnish the light and power for the Spaulding Building of this city, and are operated on city gas. Among other lines might be mentioned a gas meter account, industrial appliances and a full line of loggers and contractors' machinery. They have excellent display rooms at 71-73 Fifth street.

INDUSTRIAL

THE OPERATION OF THE NEWEST TELEPHONE SELECTOR.

BY K. W. ENDRES.

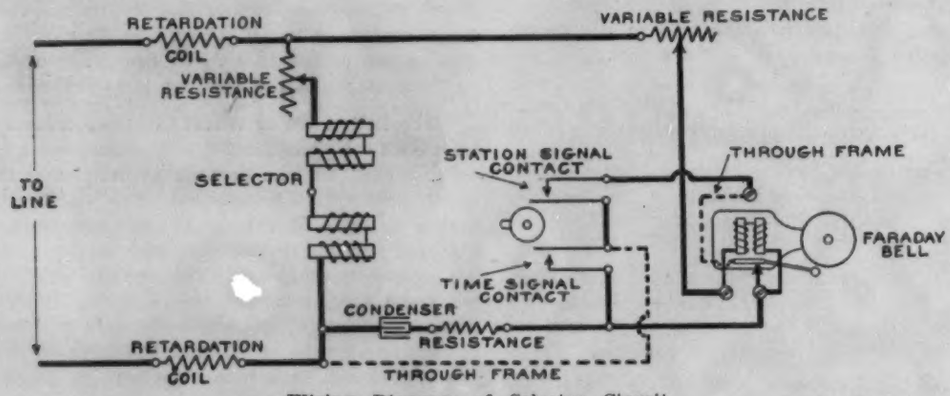
The growth in popularity of the telephone system of train dispatching, which has recently been replacing the telegraph on many of the most important railroads of the country, has just been shown in an order placed by the Santa Fe system for over 600 Western Electric selectors. This order exceeds by more than 400 the largest order for selectors ever before reported. The Santa Fe intends to equip its whole system with



Western Electric Selector Lid Removed.

telephones for dispatching, and when improvements at present under way are completed it will have over 7,000 miles operated by the telephone.

The selector is an ingenious mechanism for calling singly the several stations along a dispatcher's section. The Atchison, Topeka & Santa Fe, intending to conform to a quality standard throughout its dispatching circuits, will equip the entire line with the newest and most improved form of selective apparatus.



Wiring Diagram of Selector Circuit.

This new selector is a high speed, individual call mechanism and is the most simple selector in existence today. It consists of two electric-magnets or relays which are connected in series across the line. These are of a very high impedance and the number which can be bridged across a telephone circuit without affecting transmission is practically unlimited. These magnets are mounted in a brass framework on the front of which the moving parts of the mechanism are fastened; the armatures of the two magnets are at the bottom of the selector.

As will be seen from an inspection of the cut, the moving parts consist of a ratchet wheel to which is fastened a contact. This wheel is stepped around by means of a hardened steel spring pawl which appears at the top of the mechanism. This pawl and a corresponding one on the under side of the ratchet wheel are connected directly to the armatures of the magnet and, therefore, as long as the magnet operates, the pawl must move.

The contact is adjustable so that one standard form of selector is supplied at all stations. The position of the moving contact with reference to the ratchet wheel and the stationary contact determines which station shall be called, and this adjustment is simple and can be made without difficulty. It is thus seen that a selector can be taken out of one station and used in another by changing its adjustment if such a thing becomes necessary in case of emergency.

The selector is mounted on a porcelain base with heavy brass binding posts for the terminal wires. The glass cover sets in a felt-lined groove on this base and is locked by a bolt and nut passing clear through the selector. It is thus rendered inaccessible to the way-station operator but can be removed if necessary by a maintenance man.

The selector is normally operated on the central energy principle—that is, the battery for stepping it around as well as the battery for ringing the bell is located at the dispatcher's office. It can, however, be arranged for local battery service if so desired.

The operation of the Western Electric selector is as follows: In front of the train dispatcher are a number of keys, one for each equipped station on the line. These keys are practically noiseless, and each one sends out a number of rapid direct current impulses on the line when it is operated. The number of impulses which are sent out can be regulated by adjustable cams on the rear of the key so that a standard key is employed in all cases and adjusted for the particular station desired. This is an improvement in train dispatching service.

The first impulse which one of these keys sends out is a long impulse, the tooth being three or four times the width of the ordinary tooth. This impulse operates the magnet shown on the right-hand of the selector, which is a slow acting relay; it pulls up the armature of this magnet, which in turn causes the two pawls to engage with the ratchet wheel. The remaining quick impulses which the key sends out operate the magnet on the opposite side of the selector but do not affect the slow acting magnet, which remains held up; these quick impulses work the pawl which appears at the top of the selector and step the ratchet wheel around the proper number of teeth, at which point the two contacts make and the bell in the station is rung.

The remainder of the revolution of the key, after the signaling impulses are complete, keeps the key contact closed and, therefore, keeps battery on the line during a period of about five seconds. As long as this battery is on the line, the bell at the way-station rings.

By installing a simple strap key, the dispatcher can hold this down and make the way-station bell ring as long as he pleases, this strap key merely taking the place of the key contacts and keeping the circuit closed.

The selector is high speed in its operation. It requires approximately three seconds to call the thirtieth station on the line, and any one of the first ten stations will be called in one second or less. It is possible to place as many sets on the circuit as may be desired, this number being limited by the size of the ratchet wheel. The present selectors which are installed are equipped to care for fifty stations, which would cover the majority of train dispatching districts.

The schematic diagram shows how the selector is wired across the circuit, and also illustrates some of the auxiliary apparatus which is used in connection with it. Retardation coils are employed to choke back any lightning which may get by the protectors at a station. A variable resistance is required at each selector, since each must receive approximately the same current and voltage, and if this were not installed, the high voltage near the dispatcher would give the stations adjacent to his office much more current than they should obtain. The Western Electric selector requires approximately eight milli-amperes to operate and ring the bell and thirty volts across its terminals.

It will be noted on the schematic diagram that two contacts on the selector are shown. One of these is the station signal contact which normally rings the bell at the station when the train dispatcher wishes to call in the operator, and the other is a time signal contact which is operated by a special key in the dispatcher's cabinet and which makes on all selectors along the line simultaneously. The dispatcher can, therefore, with this key give all the way stations along his division a time signal whenever he may so desire. It also permits of his calling in all the stations at once if this ever becomes necessary on special occasions.

The condenser and resistance shown bridged around the contacts of the Faraday bell and in series with the windings of the bell are for the purpose of eliminating any spark at this contact and also serve to render the answer back signal of the proper loudness.

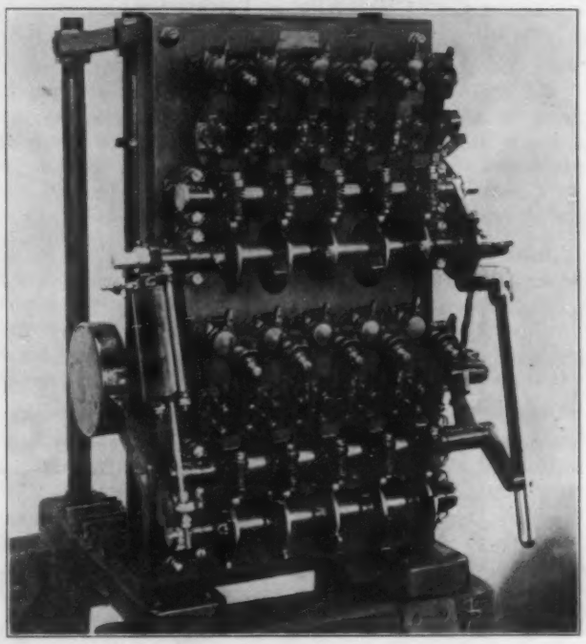
The new selector has been subjected to the most severe laboratory tests and the equivalent of many years service has been given it under test. No sign of wear in any respect developed out of 300,000 operations. The New York Central and Pennsylvania lines also have placed repeat orders for the new selector, which was given extensive experimental service on these roads.

A NEW FORM OF ALTERNATING-CURRENT ELEVATOR MOTOR CONTROLLER.

The alternating-current slip-ring induction motor is well adapted for elevator service; it has practically no wearing parts except bearings, it requires little attention, and its speed and torque characteristics are excellent for this purpose. But in spite of this, the use of alternating current for elevators has been somewhat limited on account of the difficulty in designing a suitable controlling device. Such a controller must perform a definite series of operations in an unvarying order; it must be rapid in action and yet must never complete its operation in less than a given time; and it must be incapable of disarrangement at the hands of an ignorant or careless operator. In consequence of these requirements it has been difficult to avoid complications and expense on one hand and unreliability on the other.

In a new form of alternating-current elevator controller recently placed on the market by the Westinghouse Electric and Manufacturing Company, the necessary conditions have been successfully met by means of a very simple mechanism. Every operation is performed in a positive mechanical manner. The operator has complete control over the starting and stopping of the motor, while the acceleration is performed automatically at a rate that can be adjusted over a wide range at the controller but cannot be altered by any action of the operator in the car. Any part of the controller is accessible from the front and all the parts subject to wear can be readily replaced. The electric contacts are of the quick-break, butt type and are protected by arc shields; there are no sliding contacts. All automatic operations are performed by the force of gravity.

The controller consists of a slate panel on which are mounted two rows of switches and their operating mechanism. The switches of the upper row serve to connect the motor primary with the line, and those of the lower row short-circuit the resistance in series with the motor secondary. All switches are alike and interchangeable. Five primary switches are used for a three-phase controller and six for a two-phase controller. The switches are opened and closed by cams. In closing, each cam acts on its own switch through a buffer spring which serves as a cushion and also compensates for wear; in opening, a lug on the cam engages a projection on the switch arm and forces the switch open. The resistors for the motor secondary are mounted on the rear of the panel.



A. C. Elevator Motor Controller.

The movement of a hand rope or lever in the elevator car operates a sprocket attached to the primary cam shaft. A turn of the cam shaft from the off-position closes a set of primary switches and starts the motor so that the elevator car moves up or down, according to the way the shaft is turned. The movement of the cam shaft simultaneously releases a catch and allows a weight, attached to an arm geared to the secondary cam shaft, to fall; the arm rotates the secondary cam shaft and closes the secondary switches in proper order. The fall of the weight is retarded by an air dash-pot, the piston speed of which can be so adjusted by means of a valve that proper acceleration can be given to the motor. Turning the cam shaft from the off-position in the opposite direction closes another set of primary switches and reverses the direction of rotation of the motor; the secondary switches always close in the same order.

On turning the controller to the off-position, the secondary switches are opened, the weight is raised and set ready for the next operation, and the primary switches are opened; this completely disconnects the motor from the line and stops it. The off-position is plainly indicated to the operator by a notch. Positive stops prevent over-running beyond the full speed positions.

This controller is made for use in connection with two and three-phase a.c. slip-ring induction motors of 30 h.p. and less, for all voltages under 550, and for all commercial frequencies.

NEWS NOTES

TRANSMISSION.

BEND, ORE.—Machinery for the electric light and power plant of the Bend Water, Light & Power Company has arrived and will be installed during the next few weeks. The transmission line is ready.

TACOMA, WASH.—Commissioner of Light and Water Lawson was instructed to advertise for bids for the construction of the substation power plant in this city. The estimated cost of this building is $104,000.

GOLDFIELD, NEV.—In speaking of the Lucky Boy mine recently, J. H. Miller, president of the Goldfield Alamo M. & L. Co., who is operating the property, said that the power line of the Pacific Hydro Power Company, which is now installing a plant near Mono Lake, will be extended to the Lucky Boy in September.

SALT LAKE CITY, UTAH.—Announcement is made from the office of the Utah Light & Railway Company, that this company intends in the near future to extend its distributing system in Davis County for the purpose of developing an electric lighting and power market in the towns and territory between Salt Lake City and Ogden.

LAS VEGAS, N. M.—Territorial Engineer V. F. Sullivan has approved the application of J. J. Laubach, Wm. Harper, W. J. Benjamin and W. B. Bunker, all of this city, for the construction of a power plant on Rio de la Casa. The plant will cost $100,000. A diversion dam 15 ft. in height and 35 ft. wide at the top and 50 ft. wide at the bottom will be built.

ALBANY, ORE.—The power transmission line of the Northwestern Corporation is being surveyed from the site of the plant at Martin's Rapids on the McKenzie river down the valley. Eugene, Springfield, Junction City, Harisburg, Albany, Corvallis, Independence, Monmouth and Dallas are among the places to be furnished with electricity. The party is now at Coberg, six miles north of Eugene.

SAN DIEGO, CAL.—Under the supervision of Andrew Ervast, engineer for the San Diego Electric Railway Company, plans have been drawn for a new power station costing about $225,000, which is to occupy practically the entire block from D to E streets, and from Arctic to California street. The company will also erect a $40,000 machine shop at the corner of Fifteenth and L streets.

SACRAMENTO, CAL.—The Great Western Power Company has almost completed the installation of machinery at its city sub-power station at Eighth and R streets, but material for installing the local retail light and power service has not all arrived from the factories in the East. It is announced at the offices of the company in this city that no definite date has been set for opening local service.

OAKLAND, CAL.—The application of the Central Light & Power Company to erect pole lines for the distribution of light and power has been referred to the Board of Public Works to the city engineer and city electricians. The company desires to erect the poles at First and Alice streets, thence to Second to Harrison, to Twelfth; also on First, Webster, Third, Oak, Fifth, Sixth, Franklin and adjacent streets.

RENO, NEV.—The Sierra Pacific Power Company, which is the holding company of the Truckee River General Electric Company and the Reno Power Company, has applied for 500 feet of water from the Truckee river, to be taken a short distance above Verdi and carried to a big reservoir. From this reservoir it will be carried in steel and wooden pipes to a site near the Washoe power plant, where the new power plant, capable of developing 3000 h.p., will be erected.

BEND, ORE.—R. G. Gould has returned from Crescent, where he has been engaged in engineering work on a power proposition. Mr. Gould, after a couple of weeks of preliminary surveying and prospecting, found the best dam location about a mile below the Crescent townsite on the Little Deschutes. The proposed dam will be 150 feet long and 15 feet high. A ditch about 5000 feet in length will have to be built to lead the water to a location adaptable to the best production of power. The survey work is being done in the interests of Dr. N. E. Winnard of Albany and others interested with him.

STOCKTON, WASH.—With the permission to erect a power plant with a daily capacity of 25,000 h.p. on the Pend Oreille River near Waneta granted, the Pacific Exploration Company is preparing for active operations. W. H. Jones of Portland and a number of Spokane capitalists are interested in the new project, and H. G. Hall of Nelson, B. C., will be president, J. W. Falls, manager, and A. Y. Lorch, secretary. Electric power for the Pend Oreille Valley, Sheep Creek and Ymir districts and the Orient, Chewiah and Metaline districts will be supplied, while the Northport smelter will be another consumer.

SAN FRANCISCO, CAL.—A. G. Wishon says: "The San Joaquin Power Co. is planning to hang some 2,000,000 pounds of wire in its valley power lines. The routes provide for 400 miles of wire. In six months we will have current supplied to the Midway and Sunset oil fields. There will be 350 miles of line aside from the secondaries. We will build lines to Bakersfield, Maricopa, the Midway and down the West Side from the new power plant in Crane Valley. Following this we will rush our power line to Merced. Then we will provide power for the Kings River quarry. We next will prepare to extend the power line from Merced falls to Exchequer to supply the rock crushing plant there. Steps will be taken as well to provide power for the Santa Fe rock crushing plant on the Kings River. Power will be supplied, before all our plans are completed, to the Kern County oil fields by way of Bakersfield." E. L. Haines, electrical engineer in the San Francisco office of the J. J. White Co., the concern in charge of the construction of the new Crane Valley power plant, is in Fresno consulting with General Manager Wishon as to the best route for the prospective power lines. A full set of estimates for the route is being made out.

TRANSPORTATION.

STOCKTON, CAL.—The street railway employes of Stockton employed by the Central California Traction Company have been granted an increase in pay of 2c per hour.

LOS ANGELES, CAL.—Residents in the north and northwestern part of the city have petitioned the Council to offer for sale a street railway franchise through the North Broadway tunnel.

WHITE SALMON, ORE.—The survey for the base line of the Mt. Adams Electric Line has been completed and the engineers are now making the permanent survey which will determine the actual cost of the system.

SACRAMENTO, CAL.—In order to assure adequate street car service to the people of Sacramento and the thousands of visitors who will be here during the Fiesta of the Dawn of Gold and the State Fair, Charles W. McKillip, local manager of the Sacramento Electric, Gas & Railway Company, is making special efforts to get extra cars from outside points for use on the lines here while the festival is in progress. It is more than likely that McKillip will obtain cars from the Ocean Shore Railroad, which is not now operating.

LONG BEACH, CAL.—The Richards Neustadt Co., of Los Angeles, has been given a contract to complete a reinforced substructure for the Southern California Edison Company's power plant at the harbor. The cost of the work will be $89,000.

LOS ANGELES, CAL.—Electric car service of the Pacific Electric Railway Company between Los Angeles and El Monte is to be improved. The Covina line is double-tracked as far as El Monte and rest of route will be rushed. The grade was originally made for two tracks.

OAKLAND, CAL.—Frederick Brooks, construction engineer for the Oakland & Antioch Railroad, has announced that during the early part of the coming month rails will be laid from Walnut Creek to Bay Point. That having been done, work on the Concord-Martinez branch will be undertaken and extended to Lafayette.

LOS ANGELES, CAL.—The North, Northeast and Northwest Improvement Association has asked the Council to reconsider its action in refusing a franchise to the Los Angeles Railway Company on Ann and Alpine streets. The association declares the transportation service could be better if this franchise were granted.

LOS ANGELES, CAL.—Members of South Hoover and West Vernon Improvement Association will hold an important meeting next week. A resolution to offer for sale a franchise for an electric car line in Vernon avenue to connect southeastern and southwestern sections of the city is to submitted to the City Council.

UPLANDS, CAL.—The Pomona Board of Trade Committee having in charge the completion of raising of funds required to provide free right of way for the Pacific Electric Railway from Claremont city limits west and southwest into Pomona, has successfully completed its work. Money is pledged and ready to be paid to W. G. Kerckhoff on condition that road is built and completed between that city and Claremont and Upland by January 1st. It is stated that the company will commence construction work soon in an endeavor to have the road completed early in December.

SACRAMENTO, CAL.—The new Central California Traction Company started interurban service between Sacramento and Stockton Monday, August 29th. A party consisting of Alden Anderson, president of the new road; George W. Peltier, vice-president; Samuel Napthaly, directing engineer; Frank C. Miller, chief engineer and superintendent of operation and J. H. Leary left the Sacramento terminus at Eighth and I streets Sunday afternoon for a trip of inspection. With the third rail system completed the regular two-hour schedule between Sacramento and Stockton will be inaugurated. The 30 new cars which the company will place in operation on the interurban service have a carrying capacity of 60 people.

SANTA MONICA, CAL.—Practically every wheel of the Los Angeles Pacific Railroad was tied up August 29th and all traffic between the beaches and Los Angeles was interrupted through the walkout of twenty men who operate the seven transforming power stations along the route. They quit work because of the refusal of the company to give attention to their request of an increase in wages from $85 to $90 a month. Thousands of persons who live at the beach and work in Los Angeles were prevented from reaching the city for many hours. Automobiles and carriages were brought into requisition and brought fancy prices. Later the men returned to work upon order of General Manager Sherman that they all would be discharged unless they were at their posts within half an hour. Sherman says he will investigate the wage question of the men later.

HANFORD, CAL.—Work on the Hanford and Summit Railroad, an electric line 18 miles long, running between Hanford and Summit Lake, a settlement in the Kings river delta, was commenced at Hardwick this week and the expectations are that it will be completed within 90 days. The railroad will cost about $500,000 and is being built under the supervision of John B. Rogers, chief engineer and general manager of the company, and chief engineer of the Ocean Shore Railroad. The officers of the railroad company are Charles King, a Hanford capitalist, president; Ralph W. Heins of Santa Cruz, vice-president; L. L. Hickman, president of the First National Bank of Hanford, treasurer; George C. Aydelotte of Hanford, secretary; John B. Rogers of San Francisco, chief engineer and general manager; Clifford McClellan of San Francisco, general counsel.

RIVERSIDE, CAL.—H. E. Huntington intends to make Riverside division headquarters for his Southern California Interurban system. Deeds have been filed here disclosing the purchase by the Pacific Electric Land Company of a 100-foot strip along First street, between Main street and Colton avenue. The price paid was $30,000. It is said to be the intention of the company to lay a 4-track line on this right of way. Plans are being prepared for an assembling station, car barns and offices at the intersection of Main and First streets, where the company has an entire block of land. The architecture will be of the mission type. A half million dollars will be expended in trolley developments in this section during the next year. The company is also engaged in securing rights of way for a line to parallel the line now connecting this city with Crestmore and which is being extended toward Bloomington and Rialto.

ILLUMINATION.

TACOMA, WASH.—The city has passed an ordinance to provide for the construction of an electric substation upon the Fifth Addition, to cost $104,000.

EUGENE, ORE.—H. M. Byllesby & Co. are spending $25,000 at Eugene in extending mains. They are figuring on adding a water-gas set to the gas plant.

GREENVILLE, CAL.—The Indian Valley Electric Light & Power Company, which has established a plant in this town, proposes to extend its service to Crescent Mills and Taylorville.

LOON LAKE, WASH.—Gherke & Sons of the Gherke Mill Company, are planning for the installation of a light and water system for this place. It is proposed to have the plants completed by May 30, 1911.

COQUILLE, ORE.—F. Norse, proprietor of the Coquille Electric Company, has returned from a trip to Portland, where he arranged for the purchase of a complete electric lighting plant which will be shipped to this city and in working order by the first of October.

LOMPOC, CAL.—A proposition has been made to the citizens of the city through their representatives in the Town Board of Trustees by the Electric Light & Power Company, now supplying the city, to sell their plant to the city free of indebtedness for $27,500. If plant is purchased it will have to be enlarged.

ESCONDIDO, CAL.—The Escondido Utilities Company since being taken over by C. C. Glass, is planning to furnish power and electric light to Twin Oaks, San Marcos and San Pasqual valleys. The cost of carrying electricity to these valleys of course would be heavy and in order to do this it would be necessary for people of these valleys to subscribe to stock of the company.

VENTURA, CAL.—Lively opposition failed to defeat the lighting bond proposition on Ventura avenue last week. By a majority of three votes the citizens of the avenue decided to tax the district to maintain a lighting system. It required but a majority to carry a proposition of this kind and the vote of 29 for and 26 against shows by how close a margin the bonds pulled through.

CRESCENT, ORE.—Surveys are being made preliminary to plans for an electric light and power plant at this place by Engineer Gould and party of Bend. The company, which has filed on a power site in the reserve a half mile north of town, is composed of Albany capitalists, at the head of whom is Dr. N. E. Winnard. It is the intention of the company to erect a dam in the canyon where the head of the Deschutes narrows to about 60 feet. More than 5000 h.p. can be developed here.

ALAMEDA, CAL.—Two thousand eight hundred and eighty-seven residents of Alameda patronize the municipal electric light plant, the total earnings of which for the last fiscal year were $109,937.81, against a total cost of production of $67,789.03, leaving the net earnings of the plant $42,-148.78. Included in the total cost of production is $13,-414.52, allowed for interests,, taxes and depreciation. There was a gain of 397 consumers for the fiscal year. About three-fourths of the residents of Alameda are patrons of the municipal plant. The plant has under consideration a bid from the Great Western Power Company to supply the city with electric current for day service. It is the opinion of the electric light commission that the current can be purchased at a lower rate than the cost of operation of the plant.

NORTH YAKIMA, WASH.—Manager A. S. Grenier of Portland was here a few days ago with Superintendent Arrowsmith looking over the intakes of the power plant on the Naches river, with a view to improving and extending the service. Mr. Grenier said, in an interview, that he did not know how much additional water-power the company could get if it wanted it, and hence was unable to make any statement as to the probable increase of the power plant in the Naches. The result of the inspection trip will probably determine largely the needs of the company. Mr. Grenier also stated that the company is now reviewing engineers' plans for an increase in the size and capacity of the gas plant. The present one, he said, which was built for a town smaller than North Yakima, is operating to its capacity, and a probable doubling of the size of the plant, to meet the demands of a city twice the size of the one it now serves, will be one of the company's next moves. The plans for the enlargement are all tentative, however, and will depend somewhat also on the increase of power which is being sought.

WATERWORKS.

BANDON, ORE.—The Council has decided that an engineer be employed to run levels to the new water reservoir and that a map be made of same and submitted to the state engineer.

LIBBY, MONT.—A waterworks system is assured for Libby. Arrangements are now under way to put in a municipal plant should the Great Falls people who are figuring on taking the franchise fail to begin operations within a reasonable time.

COLFAX, CAL.—The South Yuba Water Company is about to commence the laying of new mains and laterals here. Since building the large reservoir east of Colfax this place has an excellent water supply and the laying of new mains means better fire protection.

SPOKANE, WASH.—The Council has passed an ordinance authorizing and directing the Board of Public Works to enter into a contract with the Baker-Stearns Company for water mains in Mount Pleasant First Addition. The agreement shall provide that kalsomine pipe only shall be laid, that valves and hydrants be placed as shown on plants.

ALBANY, ORE.—A communication from the Northwestern Corporation has been presented at the Council and read, relative to the prospective extension of the water system in the eastern part of the city. The expenditure is estimated at $15,000. In the communication the corporation offers to make the improvement if the city will enter into a contract for 33 additional fire hydrants, and 30 more arc lights for a period of ten years. The communication has been referred to the committee on ways and means.

RED BLUFF, CAL.—J. W. Ivey is in this city making estimates for a water elevating pumping plant for irrigation purposes and obtaining rights of way for the proposed canal. The company represented by Ivey recently appropriated 80,-000 inches of the water of the Sacramento river and proposes to divert 5000 inches to irrigate farms in the Antelope valley.

TACOMA, WASH.—The Council has passed an ordinance providing for the construction of water main of six-inch cast iron on Melrose street and South Fifteenth street from Junett street to Cedar street and on Cedar street from South Fifteenth street to South Fourteenth street, according to plans and specifications prepared and filed in the office of the Commissioner of Light and Water.

OAKLAND, CAL.—Rights of way for pipe lines extending from near Centerville to Dumbarton Point have been granted to the Spring Valley Water Company by the Southern Pacific Company. The rights of way vary from 18 to 25 feet in width and follow the line of the Southern Pacific. At Dumbarton Point, where the rights of way end, the Spring Valley Company has a conduit under the bay by which it carries water to San Francisco.

SAN RAFAEL, CAL.—The Marin Water & Power Company has broken ground on the new dam site at the head of Fairfax grade. A force of men have been at work for some days under the management of Superintendent Barr. The concrete base is expected to be laid before the winter season sets in. The base of the dam will be 650 feet in length and the dam will be 100 feet in height and will be built of solid masonry and will have a capacity of 3,500,000,000 gallons.

WOODLAND, CAL.—The Yolo County Consolidated Water Company, whose stockholders are Yolo County capitalists has secured all the rights and interests of every irrigation system in the county, and has contracted to sell the entire property of the corporation to Lieutenant-Governor Warren Porter of Watsonville, J. W. Forgeus and others. The sale is outright and the deal will be closed as soon as an agreement is reached between the landowners adjacent to Clear Lake and the purchasers in regard to raising the level of the lake so that an unlimited supply of water for irrigating purposes and power may be assured. Most of the land owners have signed the agreement already. There will be enough water to irrigate all of Yolo and a large part of Solano County. The water will follow a creek bed for many miles, saving the expense of canal work. The present company irrigates thousands of acres with the natural flow of this creek.

OAKLAND, CAL.—In a report to the Council J. H. Dockweiler, city water expert, made known the fact that the People's Water Company had practically completed its new central reservoir, which is being constructed to meet the demands for water storage facilities. It will be ready for receiving water at the end of the present month. Nothing remains to be done but the trimming and dressing of the slopes, and the work on the concrete parapet. Dockweiler's report gives the receipts and expenditures of the water company for the six months ending June 30. The total receipts for that period, including money received for general water rents, tapping, turn on and land rents, amount to $451,315.87. The expenses, including supply and distribution, maintenance, general expenses and service construction, amounted to $147,861.15. The receipts over and above the expenses amount to $303,454.72. The taxes were $38,878.76, and the net receipts were $264,-575.96. Under the head of construction expenditures comes the central reservoir, $55,553.97; piping and street mains, $61,719.23; sundray acounts, $41,929.29, a total of $159,202.49.